

Comparison of the extent and prevalence of prescription of potentially inappropriate medications prescribed to geriatric age group residing in old-age homes versus those receiving care from tertiary care hospital using Beers criteria

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Abstract

Context: Certain medications have higher chances of causing adverse effects in geriatric age group. Evidence is against prescribing these medications to the elderly. A list of such medications is called Beers criteria, which was revised by the American Geriatrics Society in 2015.

Aims: Using the Beer's list as reference, the researchers intend to find the extent and prevalence of potentially inappropriate medication (PIM) in geriatric population residing in different settings.

Settings and Design: The researchers analyzed prescription pattern of 200 individuals with age ≥ 65 years, 100 individuals from old-age homes (OAHs) and 100 individuals from a tertiary care hospital. After collecting data, the researchers tallied each prescription with list of drugs in Beers criteria to find all the possible PIMs in both the groups.

Results: It was found that the average age of residents of OAHs was significantly higher ($P < 0.002$) than the corresponding group from a tertiary care hospital. The residents of OAHs were also receiving significantly higher ($P < 0.0001$) number of PIM than their counterparts from the tertiary care hospital. The average number of PIMs prescribed to females in OAHs was also significantly higher than those in the other group. About 55% of residents of OAHs received at least one PIM, compared to just 26% in the other group. At least 27% of individuals of OAHs received two or more PIMs, compared to just 2% in a tertiary care hospital. Lorazepam was the most commonly prescribed PIM in OAHs, whereas ranitidine was the most common PIM in a tertiary care hospital. Ibuprofen was the second most common PIM, with 15% of OAHs residents receiving this drug, while none of the patients from a tertiary care hospital received ibuprofen.

Conclusion: All the results point toward a poor prescription pattern in the residents of OAHs compared to those receiving care from a tertiary care hospital.

Keywords: Beers criteria, elderly, geriatric, old-age homes, potentially inappropriate medication, tertiary care hospital

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INTRODUCTION

India has the second largest population in the world, with the country hosting world's second largest geriatric population.^[1] At the same time, due to urbanization, the concept of traditional Indian joint family is disintegrating. This has led to increasing number of the elderly shifting to old-age homes (OAHs). With increasing age comes the concern of chronic diseases. It has been found that around 45% of elderly Indians have chronic diseases.^[2] The problem is exacerbated by the fact that people living in OAHs are away from family members who can take care of them. This has shown to negatively affect the quality of life and health of the elderly living in OAHs.^[3] Hence, it is prudent to compare and contrast numerous aspects of life between the two groups of the elderly: those living in OAHs and those residing in their familial homes. Various studies have been made describing the discrepancies in quality of life between these two populations.^[3-5] However, not much data are available on the differences in medical care. Hence, the present study was conducted to assess the extent and prevalence of the prescription of potentially inappropriate medications (PIMs). PIM is not a complete measure of medical care; however, it gives an idea of the prescription patterns at both locations, which in turn can be used as one of the many indices to measure the quality of care. The elderly are most vulnerable to polypharmacy as they suffer from several comorbidities.^[6] Polypharmacy, in turn, increases the chances of prescription of PIMs. In this project, the researchers use the recently updated list of medications in Beers criteria published in 2015 by the American Geriatrics Society.^[7] While several different criteria are present for identification of PIM in the elderly, namely STOPP criteria, Beers criteria is the most popular and comprehensive. A comparative study found Beers criteria to be more stringent than STOPP criteria, causing more drugs to be identified as inappropriate than STOPP criteria.^[8] Researchers find it important to use a more comprehensive list as the geriatric population is found to be one that is most vulnerable to the adverse effects of PIM.

Objectives

The objective of the study was to compare the extent and prevalence of prescription of PIM between residents of OAHs and geriatric population receiving care from a tertiary care hospital using Beers criteria.

Study method

After obtaining permission from the Institutional Ethics Committee, a cross-sectional descriptive study was conducted for a total of 3 months, on elderly people from

two different settings: (a) OAHs and (b) a tertiary care hospital. A total of 200 adults, 100 from each setting, with age ≥ 65 years were selected randomly. Twelve OAHs were randomly selected from a list of all OAHs in Ahmedabad using a random number generator. Excluded were those OAHs that scheduled regular visits to a hospital or those that were consulted by a specialist. Furthermore, excluded were those patients in OAHs who were actively taking medications from a specialist outside of the primary care physician visiting the facility. Those who went to a tertiary care hospital for any reason (emergency, for example) but were not actively taking medications prescribed by a specialist at the time of study were included in the study (16 patients). The patients at the tertiary care hospital were also randomly selected and as equally divided as possible from both inpatient and outpatient units of medicine, orthopedic, cardiology, and rheumatology departments. Participants who did not give consent were excluded from the project. Also excluded were adults ≥ 65 years of age at a tertiary care hospital who did not live with their families. Each participant was interviewed after getting appropriate consent. The researchers collected information regarding the generic name of drug. This was done by physically looking at each drug leaflet and confirming it with the patient's prescription. After obtaining the required information from a total of 200 patients, the data were entered and managed on Microsoft Excel (Office 2018). The researchers later analyzed the data using IBM SPSS, statistical package for social sciences. 23.0, (Armonk, New York, USA). Unpaired *t*-test is used and values with $P < 0.05$ were considered statistically significant.

RESULTS

Age distribution

The patients included in the study were all above the age of 65 years. Table 1 shows the distribution of age among the patients of two population.

The mean age of the elderly receiving care from a tertiary care hospital was 69.19 years with standard deviation (SD) of 4.10 years while that of those living in OAHs was 71.34 years with SD of 5.562. The difference between mean age of the two groups was statistically significant ($P < 0.002$).

Table 1: Average number of potentially inappropriate medications

Number of PIMs	Tertiary care hospital	OAHs	<i>t</i>	<i>P</i>
Mean (SD)	0.28 (0.496)	0.86 (0.892)	5.6829	<0.0001

PIM=Potentially inappropriate medication, SD=Standard deviation, OAHs=Old-age homes

Average number of drugs prescribed to each population

The average number of drugs prescribed to patients of a tertiary care hospital was 4.8 with a SD of 1.99. The average for residents of OAHs was 4.29 with a SD of 2.39. While the number was higher for patients of a tertiary care hospital, the difference was not statistically significant ($P < 0.10$).

Average number of potentially inappropriate medications prescribed to each population

There was a significant difference in the average number of PIMs between the two groups.

This difference in prescription pattern can be highlighted further by looking at the number of people in each group receiving at least one PIM [Table 2]. In patients receiving medications from a tertiary care hospital, only 26 out of 100 (26%) received a PIM (1 or more PIMs), whereas 55 out of 100 people (55%) living in OAHs received a PIM (one or more PIMs). In addition, adults living in OAHs had more instances where they were prescribed two or three PIMs.

List of potentially inappropriate medication according to Beers criteria

In Beers criteria, drugs are categorized according to the quality of evidence (QE) and strength of recommendation (SR). The use of drugs with QE = high is strongly discouraged because of evidence from several well-conducted studies. The use of drugs with QE = moderate is also discouraged as evidence is sufficient to determine the risk of adverse events, but the number, size, consistency, and quality of supporting studies are not up to the standard of QE = high.

As seen in Table 3, drugs prescribed to residents of OAHs carry, on an average, a higher QE. In those receiving care from a tertiary care hospital, only 1 out of 9 (11%) drugs carried a QE = high, whereas 5 out of 20 (25%) PIMs prescribed to residents of OAHs carried a QE = high.

The most commonly prescribed PIM in residents of OAHs were ibuprofen and diclofenac, while lorazepam was most commonly prescribed PIM in both OAHs and tertiary care hospitals. As seen in Table 4, the number of PIM prescribed to females of OAHs (0.714) was significantly higher ($P < 0.0038$) than that of the other group (0.22). Patients in tertiary care hospitals were mostly prescribed aceclofenac, a comparatively safer nonsteroidal anti-inflammatory drug that is not listed on Beers criteria. Interestingly enough, ranitidine was prescribed in much higher frequency in patients of tertiary care hospitals. Residents of OAHs were prescribed first-generation antihistamines and

Table 2: Frequency distribution of the number of potentially inappropriate medication

Number of PIMs	Tertiary care hospital	OAHs
0	74	45
1	24	28
2	2	24
3	0	3

PIM=Potentially inappropriate medication, OAHs=Old-age homes

Table 3: Name and frequency of potentially inappropriate medication in each group

PIM	Tertiary care hospital	OAHs	Evidence
Lorazepam	4	17	QE=High, SR=Strong
Ibuprofen	0	15	QE=Moderate, SR=Strong
Diclofenac	2	12	QE=Moderate, SR=Strong
Famotidine	0	7	QE=Moderate, SR=Strong
Alprazolam	0	3	QE=High, SR=Strong
Amitriptyline	0	3	QE=High, SR=Strong
Digoxin >0.125 mg	3	3	QE=Moderate, SR=Strong
Ranitidine	8	3	QE=Moderate, SR=Strong
Spiroinolactone >25 mg	4	3	QE=Moderate, SR=Strong
Theophylline	0	3	QE=Moderate, SR=Strong
Clonazepam	0	2	QE=High, SR=Strong
Diphenhydramine	0	2	QE=Moderate, SR=Strong
Nicorandil	1	2	QE=Moderate, SR=Weak
Risperidone	0	2	QE=Moderate, SR=Strong
Trifluoperazine	0	2	QE=Moderate, SR=Strong
Chlorpheniramine	0	1	QE=Moderate, SR=Strong
Clonidine	0	1	QE=Low, SR=Strong
Pioglitazone	0	1	QE=High, SR=Strong
Tramadol	0	1	QE=Moderate, SR=Strong
Trihexyphenidyl	0	1	QE=Moderate, SR=Strong
Duloxetine	1	0	QE=Moderate, SR=Strong
Prasugrel	1	0	QE=Moderate, SR=Weak
Sertraline	4	0	QE=Moderate, SR=Strong

PIM=Potentially inappropriate medication, QE=Quality of evidence, SR=Strength of recommendation, OAHs=Old-age homes

Table 4: Average number of potentially inappropriate medications prescribed to females in each group

Number of PIMs	Tertiary care hospital	Old-age homes	t	P
Mean (SD)	0.22 (0.49)	0.714 (0.88)	2.98	<0.0038
Number of females	37	43		

PIM=Potentially inappropriate medication, SD=Standard deviation, OAHs=Old-age homes

antipsychotics, which can cause falls and delirium. As seen in Figure 1, the residents of OAHs were significantly older than their counterparts from tertiary care hospital. None of the 100 patients of tertiary care hospitals were prescribed first-generation drugs indicating a higher prevalence of knowledge in physicians of tertiary care hospitals, a trend seen throughout the prescription pattern.

Females and potentially inappropriate medication

There were 43 females in OAHs and 37 in tertiary care hospitals. The number of PIMs prescribed to females of OAHs (0.714) was significantly higher ($P < 0.0038$) than that of the other group (0.22).

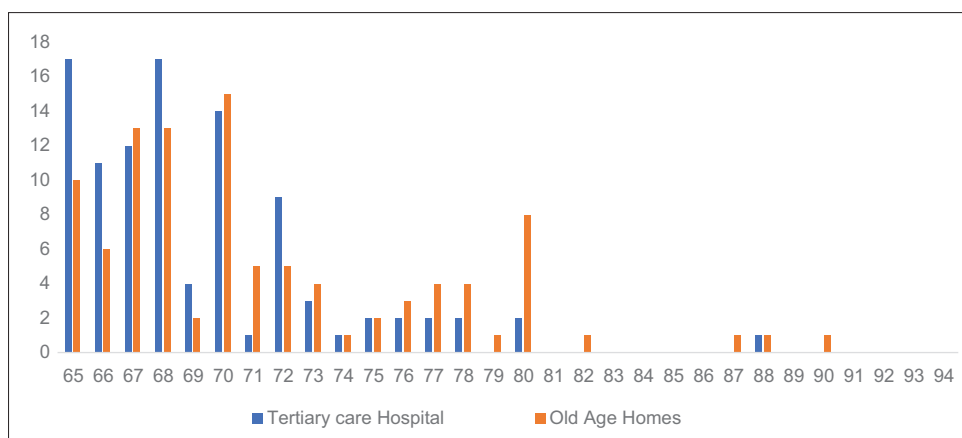


Figure 1: Age distribution

DISCUSSION

The residents of OAHs were significantly older than their counterparts from a tertiary care hospital, which is concerning as older population is more likely affected by the adverse effects of drugs, especially those living in OAHs who have limited access to health-care facilities.^[6] Even more alarming is that the average number of PIMs prescribed to females in OAHs was significantly higher ($P < 0.0038$) than those in a tertiary care hospital. Females are more likely to experience adverse effects from drugs than males and also report a higher number of adverse drug reaction per capita than males.^[9,10] The reason for this has been thought to be due to differences in pharmacokinetics of drugs.^[10]

Lorazepam is a sedative/hypnotic whose use is strongly discouraged among geriatric population (QE: High, SR: Strong). In addition to memory impairment, the use of benzodiazepines has been linked to falls, fractures, and motor vehicle accidents.^[11-14] The fact that it was the most commonly prescribed PIM among the residents of OAHs adds to the evidence of negligence of care. The number of prescriptions of sertraline, amitriptyline, and first-generation antipsychotics was higher in OAHs. These drugs carry a very high QE against their use in geriatric population.^[15]

Lack of specialty care seems to be a plausible factor in differences of prescription patterns in the two settings, since majority of OAH residents received medications from a visiting primary care physician. This is further seen in the fact that majority of residents of OAHs received diclofenac for joint pain, while majority of patients from a tertiary care hospital received aceclofenac, a drug not mentioned in the Beers criteria. Various studies have noted the superiority of aceclofenac over diclofenac in terms of safety and efficacy.^[16,17] One of the main reasons for the

recommendation of usage of aceclofenac over diclofenac is the reduced number and severity of gastrointestinal adverse effects. The superiority of prescription patterns in patients of a tertiary care hospital is also evident by the fact that while the average number of drugs prescribed to them was higher, though not significantly higher, the average number of PIMs prescribed to them was significantly lower than those in OAHs. A study done by Pakistani authors^[18] concludes that prescription patterns of general practitioners in Peshawar consist of over-prescription of analgesics and multivitamins among other drugs. This finding is similar to the finding of the current research in which diclofenac was one of the most commonly prescribed PIMs in residents of OAHs. Such discrepancies in prescription patterns could be caused by various reasons, one of which might be the lack of specialty training of primary care physicians providing care in OAHs.

The WHO has recommended an ideal average upper limit of 2.0 drugs per prescription.^[19] Findings of the current research project of an average of 4.8 drugs in a tertiary care hospital and 4.29 in OAHs suggest polypharmacy. The side effects of polypharmacy are unnecessary adverse effects, and interactions amongst different drugs themselves.^[20] The fact that the average number of drugs per prescriptions in both the settings is more than twice the recommended ideal average by the WHO raises the possibility of the presence of drug interactions and multiple undocumented adverse effects.

Merits

The researchers successfully documented all the drugs of all the patients in the study. They used the most updated list of drugs in Beers criteria. The present study is unique in that our main objective was to compare the existence of PIM between the OAHs and patients of a tertiary

care hospital. No other studies are present that could compare the two groups. The current research project produced unique results in showing exactly which drug was prescribed in abundance in which group (lorazepam and diclofenac in OAHs and ranitidine in tertiary care hospitals). In addition, the research produced results on the existence of significantly higher proportion of PIM prescribed to females, who are more likely to experience adverse effects of drugs. No other studies have produced results specific to females with regard to PIM.

Demerits

The researchers could not tally the dosage of individual drugs and the duration of treatment. They also could not verify the compliance of medications for the patients. Researchers suspect lack of compliance in residents of OAHs due to financial constraints. There is a significant difference in age of both the groups. In older patients with chronic diseases, it is inevitable to prescribe certain medications that might be categorized as PIM since it is very difficult to find an alternative medication for certain diseases (insomnia and palliative care for example). Since data from the psychiatry department of a tertiary care hospital were not included in our study, the difference between the number lorazepam, sertraline, amitriptyline, and first-generation antipsychotic prescription in the two settings might be affected.

Future work

To add on to this comprehensive study, future work can be focused on:

1. Collecting data on compliance and dosage and duration of each medication
2. Comorbidities suffered by patients of both the groups and the effect they have on prescription pattern
3. Tallying the drugs in each group with several other lists of PIM, one of which is the STOPP criteria.

CONCLUSION

Optimal drug therapy is essential in caring for the geriatric population. The changes in metabolism that come with age severely limit the type and dosage of drugs that can be prescribed to elderly. Residents of OAHs are significantly older than their counterparts receiving care at tertiary care hospitals and living with their families. At the same time, residents of OAHs receive significantly higher number of PIM per capita with higher QE than their counterparts. These data point toward a significantly poor prescription pattern in OAHs, which might ultimately add to the morbidity and poor quality of life experienced by its residents.

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Conflicts of interest

There are no conflicts of interest.

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