

The Prevalence of Prescribing Inappropriate Medications Among Older Adults in Saudi Arabia with Dementia Based on Beers Criteria: A Retrospective Study

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Background: Dementia is a common neurodegenerative disease among older adults. Therefore, they are more prone to potentially inappropriate medication (PIM), which is medication that causes more harm rather than protecting the health of an individual. Hence, the American Geriatrics Society (AGS) has recognized the risk of certain medication classes on this population and released PIM according to Beers criteria, which is a helpful guide for clinicians to ensure the safety of medication before it is prescribed. The aim of this study is to assess the prevalence of PIM use among older adults with dementia as a risk factor in comparison to other older adults without dementia.

Methods: A retrospective study was conducted in an outpatient setting in a tertiary hospital targeting elderly patients aged 65 years old or over from January 2020 to September 2022. A total of 598 patients were screened, and 270 patients met the inclusion criteria. The eligible patients were then divided into two groups: 168 were in a non-dementia group and 102 were in a dementia group.

Results: PIM use was reported in patients with and without dementia. The most inappropriate medication that was prescribed comprised atypical antipsychotics PIM for both patients with and without dementia. However, the prevalence was higher in the dementia group for quetiapine (75% vs 24% respectively), olanzapine (82% vs 17% respectively) or risperidone (92% vs 7%, respectively). Anticholinergics were highly prescribed in older adult without dementia as compared to dementia patient and was statistically significant for solifenacin (96% vs.3.6% respectively) and amitriptyline (88% vs 11% respectively).

Conclusion: Among elderly patients in outpatient care settings, the prevalence of PIM use is considered high in dementia patients for antipsychotics, while a higher use of benzodiazepine and anticholinergics was found in non-dementia patients.

Keywords: beers criteria, potentially inappropriate medication, dementia, older adults, Saudi Arabia

Background

Neurodegenerative disorders, such as dementia, are prevalent in the older adult population in Saudi Arabia.^{1,2} Generally, dementia is defined as a decline in cognitive function, which is not considered a part of the normal ageing process. It is a general term that refers to several types of symptoms of memory loss. Alzheimer's disease is the most common type of dementia.³ The current global report revealed that over 55 million patients have been diagnosed with dementia and this number is expected to increase two-fold in the next two decades.⁴ According to a cross-sectional study conducted in Saudi Arabia, the prevalence of dementia is 6.4%,⁵ which is within worldwide average of 5%–7%.¹

Older adult patients with dementia are more likely to live with multiple chronic diseases in addition to cognitive and functional limitations. Therefore, they are more prone to medication-related problems, such as polypharmacy, duplication, adverse drug reaction, and using potentially inappropriate medication (PIM).^{6,7} PIM includes medication that confer an elevated risk of harm for older adults which often exceed any clinical welfare. Consequently, PIM should be carefully evaluated before being prescribed.⁸ Beers criteria is a helpful tool used to identify PIM. It was designed by the American Geriatrics Society (AGS) and contains a list of medications that are considered potentially inappropriate for use in older adult patients in general, mostly due to the high risk of adverse drug reactions⁸ (Table 1). However, there is a section in the Beers criteria that focus on medications that should be avoided in dementia patients based on the risk of drug–disease interaction that may exacerbate dementia, as the pharmacokinetic and pharmacodynamic characteristics change with dementia progression.⁹ They are anticholinergics, antipsychotics, benzodiazepines, and non-benzodiazepine receptors agonist hypnotics.⁸

An examination of the literature reveals that there are studies that have determined the association between PIM and cognitive impairment in dementia. Most of these studies use the old version of the Beers criteria. Although the same classes have been used in both versions, the old version differs in that certain medications have been excluded while other new medications have been included.^{8,10,11} Furthermore, most of these studies were conducted exclusively in a long-term care facility setting. Recently, a study conducted in Saudi Arabia, in 2023, investigated the rates of PIMs in elderly patient. They found that PIM ranged from 19% to 80%, depending on the demographics. This study concluded that this high percentage needs additional research to figure out the reasons behind the variation across demographics and different health care settings.¹² Another study in Saudi Arabia conducted in 2022, aimed to analyze the relationship between the PIMs and frailty among inpatient older adults. This study found out that there is a strong relation between PIMs and frail older adults with multiple disorders. This study concluded that there is a strong need for clear assessment and the importance of using evaluation tools to enhance the life quality of older adult populations.¹³ The different aspects of local studies might limit the understanding of using PIM across other settings, such as an outpatient setting in which a majority of elderly patients in Saudi Arabia are treated.^{14,15} Therefore, the aim of this study is to assess the prevalence of PIM use among older adults with dementia as a risk factor as compared to other older adults without dementia.

Methodology

Study Design and Setting

This is a retrospective chart review study. The study was conducted in outpatient clinics in a tertiary hospital in Riyadh City, Saudi Arabia. The data for the study were collected from January 2020 to September 2022. This study follows the Strengthening the Reporting of Observational studies in Epidemiology “STROBE” checklist statement as recommended by Enhancing the QUALity and Transparency Of health Research “EQUATOR” guidance.

Table 1 Summary of Potentially Inappropriate Medication Tables Headings According to Beers Criteria 2019

| Terms | Definition |
|--|--|
| Potentially inappropriate medication uses in older adults | A general category that contains a variety of medications |
| Drug–disease or drug–syndrome interactions that may exacerbate the disease or syndrome | Medications to be avoided in certain disease or syndrome |
| Medication to be used with caution | Medications that might cause harm such as bleeding or has a high risk to worsen dementia |
| Potentially clinically important drug–drug interactions | Medications to avoid that cause drug interactions when combined with other medications. |
| Medication that should be avoided or have their dosage reduced | Medication that requires dose adjustment based on the renal function |

Study Participants

Participants were included based on the following inclusion criteria: 1) Dementia patients aged above 65 years; 2) who use at least one PIM; 3) patients with at least one visit to any outpatient clinic; and 4) patients who have a prescription record in the system. Patients who are younger than 65 years of age, admitted to the hospital, or had mental conditions other than dementia were excluded.

Data Collection

Data were collected and entered into a Microsoft Excel sheet. The demographic characteristics of study participants were recorded, which included age that was classified into categories (65–74, 75–84, and over 85 years), Gender (male or female), medical history, medication history, and outpatient clinic visit records. Further, the 2019 update of Beers criteria was used to identify PIM.

Statistical Analysis

Data analysis was performed using SPSS 25.0 software (SPSS Inc., Chicago, IL, USA). Descriptive analysis was reported using frequency and percentage. The prevalence of using PIM in older adult patients with/without dementia was determined using frequency and percentage. Additionally, a Chi-square test was conducted to assess the impact of using PIM on older adult patients with dementia and without dementia. This was achieved by assessing the difference between study groups (dementia vs non-dementia) in age, sex, comorbidities, and class of medications.

Ethical Approval

Ethical approval for the study was obtained from the Institutional Review Board (IRB) log number (21–380) at King Fahad Medical City (KFMC) and the need for informed consent was waived. King Fahad Medical City Institutional Review Board waived the informed consent due to the retrospective nature of the study. Participants' confidentiality was strictly observed throughout the study by using anonymous unique serial numbers for each subject and restricting data only to the investigators. The study was conducted in accordance with the Declaration of Helsinki, and before the analysis, the patients' information was anonymized and de-identified.

Results

A total of 598 patients were screened for inclusion and exclusion criteria—365 were included in the non-dementia group, and 168 met the inclusion criteria while 197 patients were excluded from the non-dementia arm. 65 exclusions were related to the age, 27 had psychiatric diseases, 34 patients had no outpatient visits, and the rest had no PIM medications. On the other hand, 233 participants were included in the dementia group, and 102 patients met the inclusion criteria while 131 patients were excluded for different reasons. Among these patients 29 patients had no outpatient visits, and only came through the ER, or had inpatient records. While 63 patients out of the 131 were excluded because they had no PIM medications, and the rest were excluded because age. The total number of patients enrolled was 270 from both groups. (Figure 1)

Demographics and Clinical Characteristics

As demonstrated in Table 2, most patients were female (54.4%) and approximately half of them were in the age category of 65–74 years (50.4%), followed by the age category of 75–84 years (33.7%). Only 15.9% were aged above 85 years. Further, hypertension was the most common comorbidities in the entire surveyed population, followed by diabetes mellitus (28% and 27%, respectively). Dementia patients were statistically significant ($P = 0.001$) to have Alzheimer's, stroke, but less ischemic heart disease in comparison to non-Dementia patient.

Prevalence of PIM Among Participants

Among the medication classes that are listed in the Beers criteria, atypical antipsychotics were the most common medications prescribed in this population (Table 3). One-hundred and fifty patients in both groups. The prevalence of atypical antipsychotics was higher and statistically significant ($P = 0.001$) in dementia patients

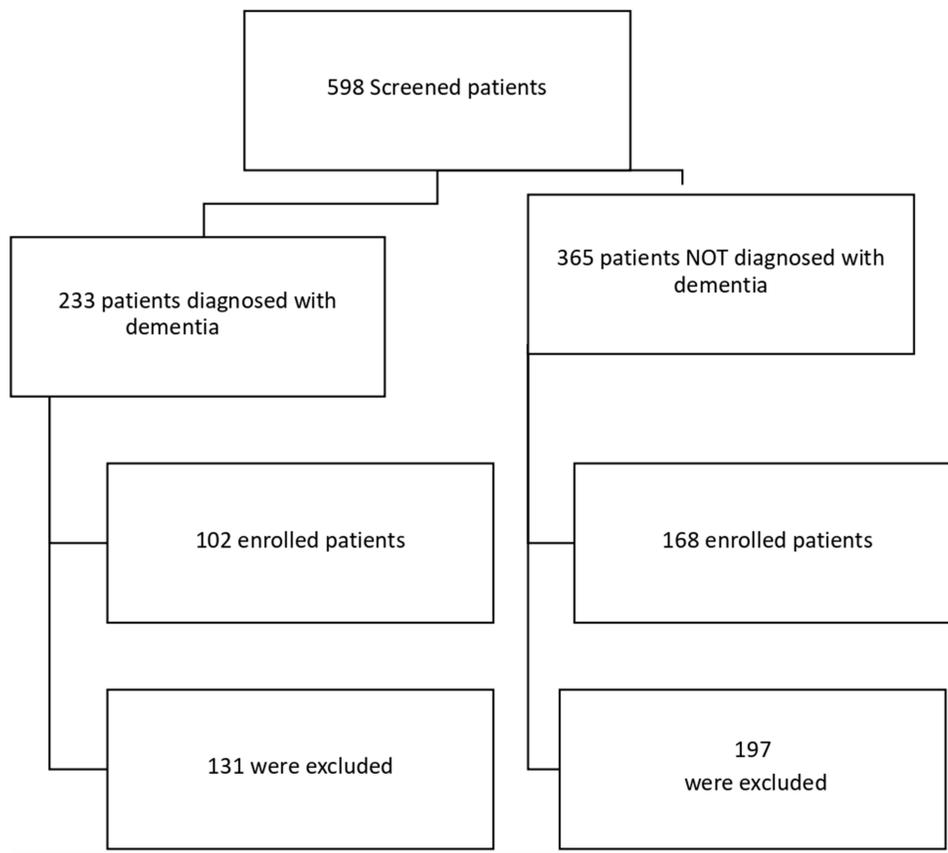


Figure 1 Screening process.

compared to non-dementia patients for quetiapine (75% vs 24% respectively), olanzapine (82% vs 17% respectively) or risperidone (92% vs 7%, respectively). However, the only typical antipsychotic used was haloperidol. We found that five patients were prescribed haloperidol in the non- dementia group compared to one patient in the dementia group.

Table 2 Patients' Demographic Characteristics

| | Total | Dementia | Non-Dementia | P-value |
|---------------|-------------|------------|--------------|---------|
| | N (%) | N (%) | N (%) | |
| Gender | | | | |
| Male | 123 (45.56) | 43 (42.16) | 80 (47.62) | 0.382 |
| Female | 147 (54.44) | 59 (57.84) | 88 (52.38) | |
| Age | | | | |
| 65–74 | 136 (50.37) | 27 (26.47) | 109 (64.88) | 0.001* |
| 75–84 | 91 (33.7) | 47 (46.08) | 44 (26.19) | |
| >85 | 43 (15.93) | 28 (27.45) | 15 (8.93) | |

(Continued)

Table 2 (Continued).

| | Total | Dementia | Non-Dementia | P-value |
|------------------------|-------------|------------|--------------|---------|
| | N (%) | N (%) | N (%) | |
| Comorbidities | | | | |
| HTN | 167 (28.6) | 68 (25.86) | 99 (30.84) | 0.204 |
| DM | 158 (27.05) | 66 (25.1) | 92 (28.6) | 0.108 |
| Stroke | 51 (8.73) | 34 (12.9) | 17 (5.3) | 0.001* |
| Alzheimer | 40 (6.85) | 37 (14.07) | 3 (0.93) | 0.001* |
| Dyslipidemia | 49 (8.39) | 17 (6.46) | 32 (9.97) | 0.623 |
| Anxiety | 27 (4.62) | 14 (5.32) | 13 (4.05) | 0.112 |
| Parkinson | 18 (3.08) | 8 (3.04) | 10 (3.12) | 0.546 |
| Osteoarthritis | 23 (3.94) | 10 (3.8) | 13 (4.05) | 0.555 |
| Ischemic heart disease | 32 (5.48) | 5 (1.9) | 27 (8.41) | 0.006* |
| Asthma | 19 (3.25) | 4 (1.52) | 15 (4.67) | 0.119 |

Note: *Statistically significant result.

Table 3 Prevalence of PIM Medications

| | Total | Dementia | Non-Dementia | P-value |
|--------------------------------|-----------|------------|--------------|---------|
| | N (%) | N (%) | N (%) | |
| Atypical antipsychotics | | | | |
| Quetiapine | 102 (100) | 77 (75.49) | 25 (24.51) | 0.001* |
| Olanzapine | 34 (100) | 28 (82.35) | 6 (17.65) | 0.001* |
| Risperidone | 14 (100) | 13 (92.86) | 1 (7.14) | 0.001* |
| Typical antipsychotic | | | | |
| Haloperidol | 6 (100) | 1 (16.66) | 5 (83.33) | 0.281 |
| Benzodiazepines | | | | |
| Lorazepam | 13 (100) | 2 (15.4) | 11 (84.61) | 0.088 |
| Clonazepam | 10 (100) | 1 (10.0) | 9 (90.0) | 0.065 |
| Alprazolam | 2 (100) | 0 (0.0) | 2 (100) | 0.269 |
| Anti-cholinergic | | | | |
| Solifenacin | 28 (100) | 1 (3.6) | 27 (96.4) | 0.001* |
| Diphenhydramine | 27 (100) | 7 (25.9) | 20 (74.0) | 0.181 |
| Amitriptyline | 45 (100) | 5 (11.1) | 40 (88.8) | 0.001* |
| Tropium | 4 (100) | 1 (25.0) | 3 (75.0) | 0.595 |
| Hyoscinebutylbromide | 9 (100) | 3 (33.3) | 6 (66.6) | 0.78 |

(Continued)

Table 3 (Continued).

| | Total | Dementia | Non- Dementia | P-value |
|--------------------------|---------|----------|---------------|---------|
| | N (%) | N (%) | N (%) | |
| Non-benzo Z-drugs | | | | |
| Zolpidem | 6 (100) | 1 (16.6) | 5 (83.3) | 0.281 |

Note: *Statistically significant result.

Benzodiazepines were less frequently used in the dementia group as compared to the non-dementia group as shown in Table 3. In terms of anticholinergic medication classes, approximately 113 out of 270 patients in both groups were prescribed a medication with anticholinergic properties; the prevalence of this was higher in the non-dementia group than that in the dementia group and was statistically significant ($P = 0.001$) for solifenacin (96% vs.3.6% respectively) and amitriptyline (88% vs 11% respectively). Lastly, five patients in the non-dementia group were prescribed zolpidem compared to one patient in the dementia group (Figure 2).

Discussion

In this study, we used the updated 2019 Beers criteria list to record PIM usage among Saudi older adults with or without dementia participants. This tool is intended to improve medication selection for geriatric patients to enhance care and minimize potential complications. The Beers criteria indicates a category of potentially inappropriate medication classes that should be avoided in older adults with dementia, including (anticholinergics, antipsychotics, benzodiazepines, and non-benzodiazepine receptors agonist hypnotics). This concern is due to their significant side effects, specifically in cognitive declined patients, which may lead to an exacerbation of cognitive impairment, confusion, hospitalization, and increased risks of mortality.^{16–18}

The most concerning medication class in the Beers criteria was atypical antipsychotics. There is an increased risk of death based on a safety warning released in 2004 regarding the use of atypical antipsychotics in the elderly with dementia.¹⁹ We found that atypical antipsychotics prescribed for dementia patients were significantly higher than those

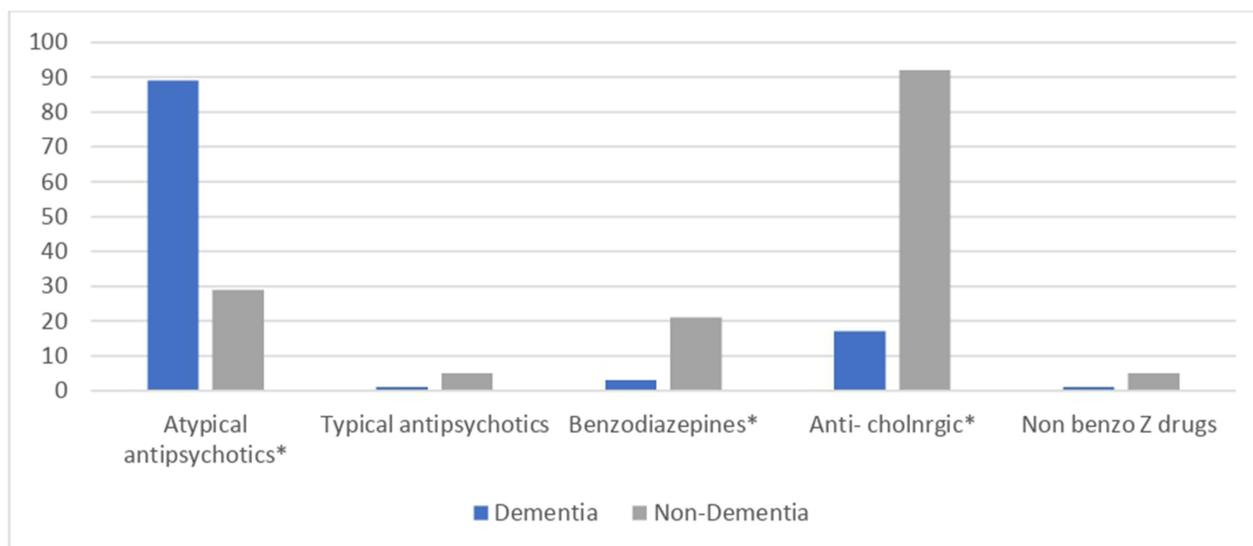


Figure 2 The prevalence of prescribing PIM among participants in the dementia and non-dementia groups.

Note: *Statistically significant result.

prescribed for non-dementia patients. For quetiapine (75% vs 24% respectively), olanzapine (82% vs 17% respectively) or risperidone (92% vs 7%, respectively). However, the use of anticholinergics was lower in the dementia group than that in the non-dementia group and was statistically significant for solifenacin (3.6% vs 96% respectively) and amitriptyline (11% vs 88% respectively). In contrast to a cross sectional study performed in the United States that found a higher prevalence of PIM use was found in dementia patients than in non-dementia patients. This study revealed that the use PIM was reported in 33.2% of patients with dementia compared to 17% of patients without dementia.¹⁰ The study also reported the use of anticholinergic and atypical antipsychotics in the dementia group as compared to the non-dementia group (20.5% vs 8.1% and 15.5% vs 0.8%, respectively).¹⁰

Benzodiazepines is another class in the Beers criteria list that must be avoided among the elderly, particularly in dementia patients. Benzodiazepines can impair cognition, mobility, and driving skills among older adults as well as increase their risk of falls.²⁰ A recent study also found an association between benzodiazepine use in older adults and increased risk of Alzheimer's disease.²¹ Our findings revealed that a higher proportion of patients in the non-dementia group had higher use of benzodiazepines than that in dementia patients. However, this was not statistically significant. In another study that examined the prevalence of PIM use among older adults with dementia, benzodiazepines use was reported in both community and long-term care settings, which was prescribed in up to 20.6% of the cases.²²

A couple of limitations of our study are the small sample size and the unequal number of participants in each group. Moreover, this study is single-center study which may limit the study's generalizability. Health care providers must work in an interdisciplinary fashion to optimize geriatric medication care. Clinical pharmacists play a fundamental role in identifying safer alternative regimens and evaluating the appropriateness, effectiveness, and safety of prescribed medications. Although, we have attempted to provide an overview of the prevalence of prescribing PIM to senior adults with and without dementia as well as outlined the class in which PIM is most prescribed in each group. However, reasons and effects of this pattern of prescription between the two groups could call for further research and investigations in Saudi Arabia to develop optimal approaches for drug management for this population and across health centers.

Conclusion

Among elderly patients in an outpatient care setting, the prevalence of potential inappropriate medication in terms of antipsychotics is considered high among dementia patients, while there was a higher use of benzodiazepine and anticholinergics among non-dementia patients.

An intervention is required to restrict PIM prescriptions, particularly to vulnerable older adults who are diagnosed with dementia. Therefore, medication management is required with the cooperation of healthcare providers for improving medication safety and effectiveness among the elderly.

Key Points

The potentially inappropriate medication (PIM) found to be frequent in older adults in Saudi Arabia.

Atypical antipsychotics found to be highly prescribed in elderly patients with or without dementia.

Anticholinergics and benzodiazepines found to be inappropriately prescribed more in patients without dementia when compared to patients with dementia.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation or in all these areas; took part in drafting, revising or critically

reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors have no competing interests to declare that are relevant to the content of this article.

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