Polypharmacy and the Use of Beers Criteria in Iranian Geriatric Patients: A Review of Published Literature

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ABSTRACT

The senior population in Iran is growing, and polypharmacy is common among them. Certain drugs are considered inappropriate in elderly due to age related changes and awareness of clinicians in this area is crucial. The Beers criteria is the most evidence based reference for proper drug selection in geriatric patients. This study reviews the scholarly articles published in English or Farsi that had studied potentially inappropriate medications (PIMs) according to beers criteria and polypharmacy in the Iranian geriatric population. By searching Pubmed, Scopus and Google scholar databases from 1989-2016, all studies in Farsi or English with key terms polypharmacy, drug-drug interactions, Beers, medication, drug, prescribing, older adult, geriatric, elderly, aging, pharmacotherapy, persian and Iran were evaluated. 11 studies were found: 5 studies on polypharmacy, 3 studies on polypharmacy and PIMs, one study on PIMs, one study on drug-drug interactions and PIMs, and only one study on polypharmacy, PIMs and drug-drug interactions. The majority of these studies were published in Farsi (8 articles). The oldest found article was conducted in 2005 and the most recent published study was in 2016. Studies in aging population in Iran are very few. This growing patient group with the highest number of drug consumption seems to be under-researched in Iran.

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Introduction

According to data available in the United States, 16% of adults are over 60 and account for 40% of the prescribed medications, with an average of 4.5 medicines per person. Our country's population is also aging. In 1996, about 6.6% of the total population of Iran was over 60 years old, which reached 7.27% in 2006, and it is anticipated that by 2020, 10% of the total population will be elderly adults. Between 2000 and 2050, the proportion of the 60-year-olds and more in the world is expected to double and increase from 10 to 21% (1, 2). Aging is an inevitable process that occurs with the gradual disappearance of biological activity and changes in pharmacokinetic (absorption, distribution, metabolism and excretion) and pharmacodynamic processes (3). Managing pharmacotherapy in geriatrics has become a matter of concern over the past years, because they usually experience co-morbidities and are prescribed multiple drugs. This could increase the risk of adverse drug events (ADEs) and interactions; it also contributes to significant health care costs (4-6). Potentially

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inappropriate medication (PIM), Polypharmacy and drug-drug interactions are the most common problems in geriatric pharmacotherapy (7-9). These problems are highly related to the increased risk of adverse drug reactions (ADR), which result in emergency department visits or hospital admissions, so increased economic costs and risk of death (10-13). The most commonly used criteria to evaluate using PIMs in the elderly is the 2003 Beers criteria, which includes a list of drugs not to be prescribed to elderly patients (6). The combination of multiple drugs by increasing the risk of potentially inappropriate medications, drug–drug interactions and subsequent adverse drug reactions, mobility and cognitive impairments, costs and hospitalization is considered as an important challenge facing the elderly (14-16). Due to the changes in demographic structure of the country, the field of aging medicine has recently been launched to handle these problems. To the best of our knowledge, there are few studies in this area in the Iranian elderly population. This study reviews the scholarly articles published in English or Farsi that had studied PIMs according to beers criteria and polypharmacy in the Iranian geriatric population.

Methods

Polypharmacy is defined as taking 5 or more types of medications in daily drug regimen (17). These include prescribed, non-prescribed and over-the counter (OTC) medications including dietary supplements such as vitamins, minerals, herbals and other botanicals. This is the most widely used definition among the literature (18). The most important way to reduce polypharmacy is using appropriate drugs and decrease the use of potentially inappropriate medications (PIM) (10). The term, PIM is used for medications which their potential risks may outweigh their benefits, especially when there are safer alternatives (19). The most commonly used criteria to evaluate using PIMs is the 2003 Beers Criteria. This criterion includes lists of medications, medication classes and drug-disease interactions that should be avoided in adults age 65 and older as determined by an expert panel (20). This criteria was initially developed by Beers et al. in order to assess inappropriate medication use among elderly residents of nursing homes, more than two decades ago (1991). Inappropriate medications were defined as drugs that are either ineffective or cause unnecessary risk (21, 22). The Beers Criteria was updated in 1997, 2003 and 2012, and the last update was published in 2015 (21, 22). The 2003 Beers criteria include 48 agents or classes considered inappropriate, independent of diagnosis, as well as medications and classes considered inappropriate in 20 conditions (23).

Searches of PUBMED and Google scholar search engines were conducted to identify articles published from 1989 to 2016. The following key words were used:

polypharmacy, drug-drug interactions, Beers, medication, drug, prescribing, older adult, geriatric, elderly, aging, pharmacotherapy, Persian and Iran.

Results

The key terms in Farsi and English resulted in 11 studies, from 2005 to 2016. The majority were published in Farsi (8 out of eleven). All of these literatures were cross-sectional studies. Each article was examined for healthcare setting, study sample, definition of aging and polypharmacy, results and criteria for PIM (Table 1). The studies were conducted in 3 types of healthcare settings: 6 were conducted in community or population based settings,(24-29) 2 in nursing homes,(30, 31) and 3 in hospitals (32-34).

The study samples in 7 studies came from patients aged 60 years or older (24, 25, 30-34), 3 studies included patients 65 years or older,(26, 27, 29)1 included patients 55 years or older (28). The sample size ranged from 170 to 3000 elderly patients. Five articles studied polypharmacy,(24, 28, 30-32) three studied polypharmacy and PIMs at the same time,(25, 26, 33) one article only studied PIMs in the elderly,(34) and one study evaluated both drug-drug interactions (DDI) and PIMs,(27) Only one study assessed polypharmacy, PIMs and DDI evaluation at the same time (32). The researchers used beers criteria in 5 studies and one study used STOPP criteria. For polyphamacy, in six studies polypharmacy was defined as taking more than five medications and in two studies, taking more than four medications were considered as polypharmacy.

Discussion

With the improvement of health and disease control, life expectancy has increased and the population of elderly people is also increasing. Increasing the population of elderly increases the incidence of multiple chronic diseases and medication use. Various studies on medication use in older adults have shown that pharmacotherapy in this age group is one of the most important health issues in the world (35). Although the elderly population accounts for a small proportion of the total population, approximately 40 % of the prescribed medications are related to this population. About 80% of the elderly suffer from chronic diseases that require long-term treatment. Their complex medical conditions often lead to multiple medication treatments which increase the possibility of medical problems such as drug-drug interactions and subsequent adverse drug reactions and taking inappropriate medications (36).

This review is the first review article that identified the status of polypharmacy, drug-drug interactions and potentially inappropriate medications in Iranian elderly people.

According to Table 1, drug-related problems are

Table 1. The details of the articles published in the area of polypharmacy and potentially inappropriate medications in Iranian geriatric population**.**

	Reference	Healthcare setting	Object	Design	Sample	Definition of aging	Results	Explanations
1	Delshad noghabi (2014)[24]	Community-dwelling elderly	Irrational use of Medicine Status (Farsi)	Cross-sectional	323	≤60	P:56.6%	P: ≤4
2	Dianati (2015)[25]	Community-dwelling elderly	Polypharmacy and its related factors (Farsi)	Cross-sectional	360	≤60	P:54.5% PIMs: 29.5%	P: ≤5 Beers criteria 2000
3	Heidari (2014)[26]	Community-dwelling elderly	Frequency of use of potentially inappropriate medications and its associated factors (Farsi)	Cross-sectional	1240	≤65	P: 43.4% PIMs: 31%	P: ≤5 Beers criteria 2003
4	Azoulay (2005)[27]	Community-dwelling elderly	Inappropriate medication prescribing (English)	Cross-sectional	3000	≤65	PIMs: 27.6% DDI: 10%	Beers criteria 1997
5	Ahmadi (2008)[28]	Community-dwelling elderly	Drug administration pattern (Farsi)	Cross-sectional	400	≤55	P: 39.6%	P: ≤ 4
6	Saeedi (2012)[29]	Hospital	Clinical Features of Elderly Patients (Farsi)	Cross-sectional	200	≤60	P:51.1 %	P: ≤5
7	Yavari (2013)[30]	Nursing home residents	Prevalence of Polypharmacy	Cross-sectional	237	≤60	P: 52.3%	P: ≤ 5
8	Saboor (2011)[31]	Nursing home residents	Drug administration pattern (Farsi)	Cross-sectional	170	≤60	P:62.4%	P: ≤5
9	Ghadimi (2011)[32]	Community-dwelling elderly	General practitioners' prescribing patterns (English)	Cross-sectional	2041	≤65	P: 44% PIMs:30% DDI: 14%	P: ≤ 5 Beers criteria 2002
10	Kavosi (2016)[33]	Hospital	Study of Non-Appropriate Medications (English)	Cross-sectional	400	≤60	P:82.9% PIMs: 31.1%	P: ≤5 STOPP criteria
11	Talebi- Taher (2014)[34]	Hospital	Surveying the inappropriate drug administration using Beers criteria (Farsi)	Crosssectional	260	≤60	PIMs:22.3%	Beers criteria 2012

P: Polypharmacy, PIMs: Potentially inappropriate medications, DDI: drug-drug interactions.

very high in older adults. Polypharmacy in a study that evaluated pharmacotherapy in over the age of 55 years less than other studies, which indicates that polypharmacy increases with age (28).

In the systematic review on healthcare outcomes associated with Beers criteria by Jano et al., in 2007, 18 articles from October 1991 to October 2006 found and analyzed; Most of the 18 studies evaluated were retrospective cohort studies involving patients 65 years or older from diverse healthcare settings. The results of the analysis of 18 articles were reported as follows: across healthcare settings, inappropriate medication use was associated with adverse drug reactions and costs but not with other outcome measures (21).

In the review article on drug-related problems by Hanlon et al., in 2003; 7 articles from 2002 to 2003 found. Articles were evaluated drug-related problems, inappropriate prescribing and ADRs in geriatrics. The result of this review article showed that drug-related problems are common in the elderly patients (37).

In the integrative review on drug-drug interactions and adverse drug reactions in polypharmacy among older adults by Rodrigues et al. in 2013, 47 articles analyzed: 24 studies concerning ADR, 14 studies DDI, and 9 studies on DDI and ADR. The result of this review showed that DDI and ADR among older adults continue to be a significant issue in the worldwide (38).

Conclusion

According to results of this review article and other studies, the problems due to pharmacotherapy in the elderly are very high and an appropriate pharmacotherapy with minimal complications is a global concern. There are only 11 studies in this field and it can be a good potential area for researchers that have interest in the subject of geriatric pharmacotherapy. A large patient population in nursing homes, hospitals caring for specific groups, and general wards in available for research.

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