Review Article

Evaluation of the prevalence and influencing factors on poly-pharmacy among elderly patients - A review

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Abstract

The evaluation of adverse effects caused by poly-pharmacy (PHP) in patients, especially in the elderly group, is very important. The purpose of the present study was to evaluate the prevalence and factors affecting PHP in elderly patients. This study was conducted as a narrative review. Related articles were downloaded using reliable international databases and specialized mesh terms. Finally, the results of 29 articles were extracted based on the authors' names, study location, sample size, and key results. The findings of the study showed that the prevalence of PHP in the elderly was higher after discharge from the hospital than during hospitalization. In addition, the prevalence of PHP in the elderly who lived in care centers was higher than in those who lived at home. Based on the findings, there was a relationship between the source of obtaining information about drugs and the pattern of PHP consumption. The findings of the present study showed that PHP leads to serious complications in the elderly. Based on the results of the study, it can be concluded that some variables such as age, sex, health level, financial status, place of residence, type of disease, number of simultaneous diseases, hospitalization, duration of hospitalization, level of awareness of the elderly and their caregivers, the care place of elderly, and the number of visits of the elderly to the physician can be effective in the prevalence of PHP. Strategies such as choosing treatment goals for each patient in preventing unnecessary drug use, identifying at-risk groups, and periodically monitoring the benefits and side effects of drugs can be effective in reducing drug complications caused by PHP in the elderly.

Keywords: Adverse effects, drug disorders, elderly patients, hospitalization, poly-pharmacy

Introduction

Population aging is one of the most important health challenges in the 21st century.[1] This process of population aging is a multidimensional human, social, economic, cultural, and health issue.[2] Due to the physiological changes caused by aging, the elderly are susceptible to many diseases. The occurrence of many diseases in the elderly causes these people to take more drugs than in other periods of life and, as a result, suffer more drug complications.[3] Decreased heart efficiency, decreased liver function, decreased kidney function, hemodynamic changes, drug interactions, and the use of non-prescription drugs aggravate the clinical condition of the elderly.[4]

There is no single definition of poly-pharmacy (PHP) in the literature. However, in some studies, the simultaneous use of four or more drugs per day, and in some other texts, the

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simultaneous use of five or more drugs is called PPH.[5,6] PPH is a condition in which a person takes a large number of drugs, some of which may be necessary and some of which may not be necessary.[7] The use of several drugs is considered a special problem of drug therapy in elderly patients. PPH is a common occurrence in most chronic diseases. Certain medical conditions that increase the prevalence of PPH in the elderly include cardiovascular diseases (especially high blood pressure), various cardiac dysrhythmias such as atrial fibrillation and ischemic heart diseases, rheumatic and respiratory diseases, and dementia.[7,8]

According to the results of published studies, the elderly take more drugs than young and middle-aged people. Obviously, the higher the number of drugs used, the higher the risk of unwanted side reactions, drug interactions, and drug toxicity.[9] Drug side effects and mild-to-severe drug poisoning in the elderly increase the probability of behavioral and cognitive changes.[10] One of the most important factors that aggravates PPH in the elderly is the prescription of drugs in excess of the need due to insufficient training of medical staff on the difference between the drug treatment of the elderly and young adults.[11,12]

In the elderly, adverse reactions to drugs are common. Some studies show that 17% of the hospitalizations of people over 66 years of age were due to drug side effects, and in one-third of the studied people, there was a possibility of developing medical complications caused by drug therapy during hospitalization.[13]

The most common complications of PPH include drug interactions, drug cravings, adverse drug reactions, side effects, re-hospitalization, and increased treatment costs.[5,7,8] However, to control and treat some chronic diseases, using several drugs at the same time is useful, but some PHPs are inappropriate and cause drug interactions and harmful reactions.[5,8]

A large number of risk factors related to PPH can be divided into three main categories: demographic characteristics of the elderly, health status, and health center characteristics.[14,15] Several studies indicate that the prevalence of PPH increases with age. This may be due to the increase in improper prescription of drugs, lack of use of appropriate treatment, medication errors, weak prohibitions for the use of drugs, and the increase in the number of drugs that can be used without a prescription.[14,16] In addition to age, other variables have an effect on PPH status, such as sex, occupation, and adherence to medication orders.[17]

Although there are guidelines to prevent the prescription of several drugs, this is less followed in the elderly due to the presence of several chronic diseases at the same time. In addition, due to the rapid growth of the elderly population, paying attention to the issue of PPH and its complications has been of particular importance. By increasing the awareness of health service providers in this field, it is possible to reduce hospitalization related to drug problems and reduce drug costs.[18]

Considering the elderly population as one of the vulnerable population groups in society, the aim of this study was to review and evaluate the PPH situation in these elderly people based on previous similar studies.

Material and Methods

Search strategy

This study aimed to investigate the influencing factors on PHP in the elderly population. For this purpose, systematic searches of internationally available databases, including Web of Science, Science Direct, Scopus, PubMed, and Google Scholar, were performed between 2000 and 2022. In addition, the databases with Persian language such as SID and Magiran were included with specialized keywords. Systematic reviews using Mesh terms "Polypharmacy," "Taking Medication," "Prescription," "Elderly Population," "Drug Side Effects," "Taking the Number of Medicines," "Instructions," "Old Age," "Medication Adherence," "Health Outcomes," "Patterns of Drug Use," "Elderly Patients," "Adverse Effects," "Medicine," and "Pharmacology" were performed. For other databases, the same Mesh terms were used similarly. In addition, unofficial reports, articles in a letter-to-editor format, and unpublished articles and content posted on internet sites were removed from the list of downloaded files.

Data selection

After the electronic search of all databases, to determine the eligibility of studies, the screening was done in three phases by the authors separately, including phase I, II, and III. In phase I, the tittle and abstract of articles were checked, and in phase II, studies with unrelated tittles or that did not match with inclusion criteria were deleted. In phase III, the final selected full-text articles were evaluated for extraction of considered results. The references of full-text articles were thoroughly evaluated to verify that no articles were missed for inclusion in the study (reference checking). In addition, the citations from the full-text articles were checked (citation tracing) to ensure that the search was thorough and successful. Finally, the results of 29 published articles were reviewed for the present study.

Results

In the present study, the results of 29 previously conducted studies were evaluated. The results of past studies related to some items such as the prevalence of PHP, sample size, factors affecting PHP, and complications and consequences of PHP are presented in Table 1.[5-8,12,15,17-39]

The results of the present study showed that the prevalence of PHP in the elderly has increased in the last few decades.[14] Based on the findings of the present study, the highest prevalence of

Table 1: Summary of the descriptive results of past studies

Reference (Authors and year)	Study location	Sample size	Outstanding and key results
Slabaugh *et al.* (2010)[19]	Italy	349689	• 39.4% of study participants had at least one period of PHP during the study. • The prevalence of PHP increased with increasing age and chronic diseases, living in urban areas, and male sex. • More than 35% of those exposed to PHP were involved for at least 101 days per year. • The most used drugs included antithrombolytics, stomach ulcer and antireflux drugs, and ACE inhibitors.
Dagli and Sharma (2014)[20]	India	-	• The prevalence and rate of polypharmacy and improper use of drugs in the elderly was between 11.5% and 62.5%. • The incidence of adverse drug reactions (ADRs) in the elderly increased with the increase in drug consumption. • Polypharmacy can cause fatigue, drowsiness, loss of consciousness, constipation or diarrhea, urinary incontinence, loss of appetite, confusion, falls, depression, and dizziness.
Venturini *et al.* (2011)[21]	Brazil	438	• 85.8% of elderly people were under drug treatment, of which 90.4% were women. • The average number of drugs used by people under 80 years old was 3.2±2.6. • Women under 80 used more drugs than men of the same age. While men older than 80 years used more drugs than other age groups.
Jyrkkä *et al.* (2009)[22]	Finland	700	• The mortality rate was 37% in the first stage and 40% in the second stage. The death rate was higher in the elderly under intensive PHP.
Wong *et al.* (2011)[23]	USA	1395	• The proportion of patients over 80 years old reached 13.3% in 1988-1994 to 22.4% in 2003-2007. • In the two mentioned time periods, the proportion of patients with heart failure who took 5 or more drugs increased from 42.1% to 58%. • In the two mentioned time periods, the average number of drugs prescribed increased from 4.1 to 6.4 cases.
Kim *et al.* (2014)[29]	South Korea	319185	• 86.4% of the elderly under study had PHP. • 44.9% of the elderly under study had severe PHP and 3% had moderate PHP. • There was a relationship between the amount of PHP and the covered center; as such, the elderly who were covered by health insurance were more exposed to PHP than those covered by medical assistance.
Chan *et al.* (2009)[30]	Taiwan	11788	• The prevalence of PHP in the studied individuals was 38%. • 32.5% of disabled elderly were exposed to PHP more than 181 days per year. • The prevalence of PHP was influenced by variables such as age over 80 years, living in the city, high number of chronic diseases, and poor physical performance.
Alic *et al.* (2011)[31]	Bosnia and Herzegovina	54	• The most common diseases associated with PHP were cardiovascular diseases, diabetes, and inflammatory diseases. • The most common diseases associated with PHP were cardiovascular diseases, diabetes, and inflammatory diseases. • The most common drugs included anti-inflammatory drugs, benzodiazepines, and antihistamines. • 33.3% of people living alone had PHP. • As cognitive function decreases, PHP increases.
Delshad Noghabi *et al.* (2013)[17]	Iran	323	• More than 72.1% of the studied elderly were taking medicine. • The average number of drug consumption was 4.06±0.3 drugs per day. • 56.3% of the studied elderly had PHP. • There was a significant relationship between the status of PHP with gender (P<0.0001), occupation (P=0.004), and adherence to medication orders (P=0.017).
Kumar and Kumar (2021)[38]	India		• It is critical to do research on PHP in a nation like India or other low- to medium-income countries. • PHP is induced by a multitude of variables at the levels of health-seeking, prescription, distribution, and usage. • Society-based issues such as a lack of education and access to adequate healthcare in both rural and urban regions, as well as a general lack of health knowledge and passion, further aggravate the situation of PHP. • Poly-pharmacy is a key challenge in senior care. • Multiple drugs used by an aged person can increase the likelihood of drug-drug interactions, noncompliance with the prescription, adverse drug responses, and reduced patient compliance.
Kutsal *et al.* (2009)[39]	Turkey	1430	• The mean number of drugs was found to be higher in the females. • There was a significant difference among age groups, marital status groups, and the number of children categories. • The distribution of the number of drugs among education levels did not differ significantly. • The distribution of the number of drugs between the status of retirement and the presence of chronic disease differed significantly.

PHP was in the age group of 70–74 and 80–84 years.[7,16,26] During previous studies, PHP increased with age up to 84 years old, while it decreased from 84 years old and above.[14] In addition, previous studies showed that the prevalence of PHP in the elderly was higher after discharge from the hospital than during hospitalization. Only 3% of patients with a low number of medications were discharged after hospitalization. More than 60% of them increased the number of used drugs after discharge.[14,28]

Various studies show that more than 20% of the population over 70 years of age consume more than five drugs, which are prescribed due to the presence of several diseases in the elderly.[26,27] Therefore, it is assumed that hospitalization increases the amount of PHP. According to the findings of the present study, compared to men, women consume more drugs during hospitalization and at the time of discharge.[28]

The results of various studies show that the largest group of drug users in the elderly with the age of less than 80 years are women,[5,6,26] whereas in the age group over 80 years old, there is no difference between the two sexes in drug consumption.[19] Furthermore, the prevalence of PHP in the elderly who live in care centers is higher than in the elderly who live at home.[15]

Elderly women in the age group of 65–74 years and with a middle school education level and below, single elderly people, and people with more than four diseases at the same time are the most exposed to PHP. In people with average financial status, simultaneous use of several drugs is less common.[7,16] Having diseases such as high blood pressure, ischemic heart diseases, diabetes mellitus, chronic pulmonary failure, chronic kidney failure, osteoporosis, and osteoarthritis increases the prevalence of PHP.[8,20,21,25,26,28]

The findings of the present study showed that PHP is related to variables such as gender, social status, having multiple diseases at the same time, age, level of education, job, and financial status.[7,28] In general, the risk factors related to PHP can be divided into three categories: 1) demographic characteristics, the most important of which include: age, race, and education level; 2) a person's health status, which includes poor health, depression, high blood pressure, anemia, asthma, angina, diverticulitis, osteoarthritis, gout, and diabetes; and 3) characteristics of the health center, the most important of which are the number of referrals to the health center, complementary facilities, and multipurpose providers.[8,16]

Based on the results of the present study, it was found that there is a relationship between the source of obtaining information about drugs and the pattern of PHP consumption. The most source of information was related to the group of doctors, and the least source of information was from drug instructions and pharmacists. The prevalence of PHP was higher in people whose source of information was the group of pharmacists.[29]

The findings of this study showed that PHP leads to serious complications in people. PHP is one of the important reasons for the high prevalence of unwanted drug side effects in the elderly, which itself leads to malnutrition, dysfunction, falls and fractures, re-hospitalization, and causes death in the elderly.[14,30,31]

Discussion

Based on the findings of the present study, the prevalence of PHP in the elderly population is increasing. The incidence of chronic diseases changes with age. To control the above diseases, there is a need to take several drugs at the same time in the elderly.[5,26] On the one hand, the presence of these diseases in the elderly at the same time has turned them into the largest group of drug users in society,[5] and on the other hand, the increasing spread of non-prescription or prescription drugs has made most of the elderly to take more medicine in the past.[5]

Following the aging of the population, some parameters increase, including life expectancy, the prevalence of non-destructive chronic diseases with complex drug regimens, the discovery of new drugs, drug self-treatment such as herbal therapy, over-prescription by doctors, and poor communication between patient and doctor. In this regard, the increase in the aforementioned factors also increases the prevalence of PHP in the elderly.[19]

In general, the prevalence of PHP increases with increasing age up to 84 years old, which can be due to the increase in improper prescription of drugs, lack of use of appropriate treatment methods, drug errors, easy access to drugs, drug interactions, and the simultaneous presence of several chronic diseases in the elderly.[18] In contrast, the decrease of PHP in the elderly over 84 years old may be due to the poor tolerance of the medicine by the elderly or the fear of the doctors of the side effects of the medicine.[16,21] Therefore, drug administration to these patients should be done with more caution, and the patient's hemodynamic status should be carefully monitored after taking the drug.[18]

Based on the results of the present study, it can be said that hospitalization increases the prevalence of PHP. The results of the study by Nobili *et al.* (2011)[12] showed that hospitalization does not reduce the number of medications used by the elderly. In addition, based on the findings of the mentioned study, only 13% of patients are discharged with a low number of drugs, and in more than 60% of the elderly discharged from the hospital, the number of drugs used increases. This finding can be due to the discovery of new diseases during the re-hospitalization period or the replacement of old drugs with new drugs to control the disease. In addition, the results of the abovementioned study showed that PHP is not related to the duration of hospitalization and the mortality rate in the hospital.[12] The results of the study by Wawruch *et al.* (2008)[28] revealed that the rate of PHP in the elderly admitted to the hospital was 60.3%, while in the discharged elderly, this rate was estimated to be 62.3%. Thiyahiny *et al.* (2021)[35] reported that the amount of drugs prescribed at the time of discharge increases significantly compared to the time of hospitalization.

The results of most of the previous studies showed that women are more exposed to PHP than men. This issue is probably due to the fact that women visit the doctor more frequently than men and participate more in research studies.[16,19,39] The results of the study by Venturini *et al.* (2011)[21] showed that women use more drugs than men only up to the age of 79 and after 80 years, men use more drugs than women. Kutsal *et al.* (2009)[39] reported that the rate of PHP was higher in women than in men. The reason for the aforementioned issue in those studies is that women are more worried about their health than men and thus they go to the doctor more often. In addition, colon and breast cancer prevention programs have been developed much more specifically for women.

The results of the present study showed that the prevalence of PHP in the elderly who live in urban areas is higher than in individuals who live in rural regions, and these findings can be related to their activity and lifestyle as well as their type of activity.[19] Chan *et al.* (2009)[30] reported that living in the city is one of the effective factors contributing to increasing PHP.

Based on the results of the present study, some other demographic characteristics related to the elderly, such as age, race, and education level, affect the amount of PHP. The highest amount of PHP has been observed in the age group of 65–74 years and with secondary education level and below; people with medium economic status are also more affected by PHP.[18] Nobili *et al.* (2011)[12] and Medeiros-Souza *et al.* (2007)[8] reported that the amount of PHP in the white race is higher than in the black race. Some studies such as Venturini *et al.* (2011)[21] and Dianati *et al.* (2015)[27] reported that the most PHP-consuming group included the elderly who lived alone and those who had more than four medical conditions and diseases and required pharmacological intervention. Dagli and Sharma (2014)[20] and Venturini *et al.* (2011)[21] stated that the amount of PHP was higher in the elderly with poor health status, with cognitive dysfunction, and the elderly living in care centers. Therefore, by knowing the effective factors in PHP, you can take the necessary measures to prevent PHP.

Based on the results of the present study, it was found that the risk of drug side effects increases with the increase in the amount of drugs consumed. All elderly people who take more than five drugs to treat their conditions are at risk of complications such as drug-drug reactions and interactions.[18,25] The most important consequences of PHP include adverse drug reactions (ADRs), senility syndrome, and increased mortality.[25] Various factors play a role in creating ADRs, in most cases due to pharmacokinetic changes, unknown errors, drug reactions, self-medication, and poor knowledge about the drugs used.[18] Acute kidney failure is a serious complication caused by ADR, which can cause failure of many body organs and eventually lead to death.[15]

According to the results of the present study, antithrombotics and non-steroidal anti-inflammatory drugs (NSAIDs) are the most commonly used drugs in the elderly, and the incidence of unwanted side effects is higher in the elderly. For example, warfarin, which is an antithrombotic drug, has a narrow therapeutic window and a high risk of drug-drug interactions and side effects.[15,19] Gastrointestinal bleeding also occurs following NSAID overdose.[15] Patients with coronary artery disease, asthma, and COPD have a high risk of ADRs.[20] Urinary tract infection problems and sleep problems are the most common complications of PHP in the category of geriatric syndrome. In this regard, it can be said that prescribing antibiotics to solve problems related to urinary infections is one of the causes of PHP.

Conclusion

Based on the findings of the study, it can be concluded that the prevalence of PHP in the elderly is different in various countries, and this rate is dependent on several factors. Variables such as age, gender, health level, financial status, education level, place of residence (village or city), type of disease, number of concurrent diseases, hospitalization or not, duration of hospitalization, awareness level of the elderly and their caregivers, location, elderly care (private home, hospital, or nursing home), and the number of visits to the doctor by the elderly can be effective in the prevalence of PHP. Strategies such as choosing treatment goals for each patient in preventing unnecessary drug use, identifying at-risk groups, and periodically monitoring the benefits and side effects of drugs can be effective in reducing drug complications caused by PHP in the elderly. Therefore, to control the side effects of drugs in the elderly, it is necessary to continuously monitor the patient during the treatment and educate the patient by nurses.

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Conflicts of interest

There are no conflicts of interest.

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