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Potentially inappropriate medication use and comorbidity in association with quality of life in community-dwelling older people: a cross-sectional study in Iran

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Abstract

Background Multimorbidity, polypharmacy, and potentially inappropriate medication use in older adults are prevalent and affect their quality of life. This study investigates the interrelationship between potentially inappropriate medication use, comorbidity, and quality of life among older adults in Iran.

Methods This cross-sectional study was conducted on 500 older adults in Isfahan City, Iran. The Beers Criteria for Potentially Inappropriate Medication Use in Older Adults, a health-related quality-of-life questionnaire for older adults, and the Charlson Comorbidity Index were used to gather data.

Results Our findings related to older adults living in the Isfahan community showed that the prevalence of PIM was 61.6%, and the most common drug category was painkillers. The average quality of life score was (0.86 ± 0.08), and the worst category was related to sleep status. The average score of the CCI was 3.63 ± 1.40, with the most frequent diseases being hyperlipidemia, hypertension, and diabetes. After adjusting for confounding variables, a negative relationship between CCI (B = -0.009 [SE = 0.0027], $P < 0.001$) and PIM (B = -0.03 [SE = 0.007], $P < 0.001$) with quality of life was observed.

Conclusion Potentially inappropriate medication uses and comorbidities are high in our older population, and these variables are negatively associated with quality of life in this population. There are few family physicians trained in geriatrics in Iran. Policymakers should pay attention to these issues.

Keywords Aged, Potentially Inappropriate Medications List, Comorbidity, Polypharmacy, Quality of Life

Introduction

Due to age-related diseases and disabilities, older adults take more medications than younger individuals [1]. Although older adults constitute 13% of the global population, they account for one-third of all medications consumed worldwide [2]. Additionally, age-related physiological changes affect the pharmacokinetics and pharmacodynamics of medications, making this population more susceptible to drug interactions and adverse effects [3]. Medication interactions and complications have been observed in 26% of older adults [4].The coexistence

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of multiple diseases and polypharmacy in older adults increases the prevalence of potentially inappropriate medication (PIM) use [5]. PIMs are defined as medications whose health risks outweigh their benefits when safer or more effective alternatives are available [6]. The use of these medications leads to negative health outcomes and imposes a financial burden on both patients and healthcare systems [7]. In recent years, PIM use, particularly among older adults, has become increasingly common [8]. The prevalence of PIM use varies across countries, with reported rates of 34% in China [5], 15% in India [9], and 39.6% in France [10].

Studies have shown that PIM use is associated with reduced self-care ability [11], increased hospitalization rates [12], and overall lower quality of life [13]. PIM use is also more prevalent among individuals with comorbidities [14]. A study conducted in the United States reported that patients with two or more comorbidities were more likely to use PIMs [15]. Other studies have also demonstrated a strong association between the number of comorbidities, polypharmacy, and PIM use [16, 17]. With population aging, comorbidities have increasingly become a major public health concern, negatively impacting older adults' quality of life [18]. The comorbidity index is considered an important factor in assessing survival rates. According to statistics, 25% to 50% of older adults with a chronic disease have at least one additional comorbidity [19]. Furthermore, research indicates that an increase in comorbidities significantly raises the risk of mortality [20]. The Studies conducted in different countries have reported varying findings regarding the prevalence of potentially inappropriate medication (PIM) use, comorbidities, and their effects on the health status of older adults. According to the latest Iranian census in 2015, individuals aged 60 years and older accounted for 9.3% of the population [21]. Projections indicate that this percentage will rise to 32% by 2050 [22]. Given this demographic shift, investigating the factors influencing older adults' quality of life has become increasingly important.

The significance of quality of life and health status is such that, in the twenty-first century, healthcare systems have primarily focused on improving individuals' quality of life [23]. In this context, health-related quality of life (HRQoL) serves as a key indicator for assessing overall health, providing valuable insights into individuals' physical and mental well-being and the impact of health status on their quality of life [24]. Several studies in this field have reported mixed findings. Some research indicates that age, gender, educational level, polypharmacy, and comorbidities are associated with lower quality of life [25–27]. However, other potential factors influencing older adults' quality of life remain underexplored. Gaining a deeper understanding of these factors is essential for designing more effective interventions to enhance quality of life [28].

In Iran, particularly in Isfahan, limited attention has been given to examining comorbidities and medication use among older adults, especially the effects of potentially inappropriate medication (PIM) use on various aspects of health and quality of life. Most existing studies have focused on hospitalized older adults, while research on medication use among community-dwelling older adults in Iran remains scarce. The impact of inappropriate medication use on the health of community-dwelling older adults continues to be a significant public health concern.

Findings from international studies have reported varying data on comorbidity, the prevalence of PIM use, and their effects on older adults' health status. However, there is limited information on the prevalence of inappropriate medication use and its impact on the quality of life of older adults in Iran, particularly in Isfahan. Given the urgent need for strategies to optimize medication use in this population, this study aims to assess the prevalence of PIM use based on the Beers criteria, evaluate comorbidity status, and examine health-related quality of life (HRQoL) among community-dwelling older adults in Isfahan. Furthermore, this research explores the interrelationship between potentially inappropriate medication use, comorbidities, and quality of life in older adults.

Methods

This cross-sectional study was conducted in 2023 in the health centers affiliated to Isfahan University of Medical Sciences, Isfahan, Iran.

The study population included all people aged 60 years and older. Other criteria for entering this study included the ability to answer the questionnaire, living in Isfahan City, not suffering from cognitive diseases, and willingness to participate, and the exclusion criteria included incomplete completion of the questionnaires. Data collection was done using questionnaires along with interviews. The researcher aided participants with specialized terms from the questionnaires by clarifying desired words in simple language, and collected data were entered into the questionnaires.

Sample size and sampling method

The sample size was estimated based on the following formula and considering the data from previous studies examining the relationship between comorbidity and quality of life. To detect a standardized mean difference (Δ) of 0.25 in quality-of-life scores between older people with and without comorbidities, with a 5% significance level and 80% statistical power, a total of 500 participants

was determined to be sufficient [29]. This study employed a multi-stage cluster sampling method combined with systematic sampling. In the first stage, the two main clusters were Health Centers No. 1 and 2 in Isfahan. In the second stage, five healthcare centers covered by each of these main centers were randomly selected, resulting in a total of ten centers. A complete list of older people registered in each of these ten centers was obtained. From each center, a proportionate sample of 50 older individuals was selected using a systematic sampling method, considering the population size of each center (ranging from 1,500 to 2,000 older people). From each center, a systematic sampling method was used, selecting one individual for every 30 individuals in the population list to achieve a proportionate sample of 50 older individuals.

The sample size formula used in this study was:

$$n = \left(\frac{1+\varphi}{\varphi}\right)\frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2}{\Delta^2} + \frac{Z^2_{1-\alpha/2}}{2(1+\varphi)}$$

Study instruments

Beer's criteria

Beer's criteria is a specific list of inappropriate medications that should generally be avoided in older people or should be used in a low dose or with caution in older people with a specific disease or syndrome. This criterion is updated every three years since 2012 by the American Geriatrics Society [30]. Currently, the latest update of the Beers2019 criteria has stated the potentially unsuitable medications for older people in several groups: 1- Certain medications that should always be avoided in older people. 2- Medications that should not be used in older people with a specific disease or syndrome. 3- Medications that should be used with caution in older people. 4- A list of medication-medication interactions. 5- Medicines that are considered inappropriate based on kidney dysfunction and should be dose-adjusted for each person [31]. This criterion was used in previous Iranian studies [25, 32].

In this study, we first calculated nine categories of potentially inappropriate medications for each older people, including (Anticholinergics, Antithrombotic, Anti-infective, Cardiovascular, Central nervous system, Endocrine, Gastrointestinal, Pain medications, Genitourinary), so that PIM = 1 was defined for each older people who was taking each class of medication and PIM = 0 for the older people person who was not taking any medication.

Charlson comorbidity index

Charlson Comorbidity Index or CCI is an index that predicts the ten-year survival of people with several diseases. In this index, each disease gets a score of one, two, three, or six [33]. The score assigned to each disease is based on the severity of the risks associated with each disease. The age of people also affects the CCI score. CCI score for age less than 50 years is zero, age 50–59 years one, age 60–69 years two, age 70–79 years three and eighty years and older four. The score range of this index is from 0–37 in case of age mismatch and from 0–43 in case of age matching. CCI will be calculated from the total age of older people and the score obtained from each disease. Higher scores indicate more comorbidities [34]. For example, in a 60-year-old with a history of diabetes without organ involvement, the CCI score according to the Comorbidity Index table is 3.

The validity and reliability of the Charlson Comorbidity Index questionnaire were confirmed in the study by Hosseini et al. The validity of this questionnaire was assessed through criterion validity, including concurrent and predictive validity, while its reliability was measured using the intraclass correlation coefficient (ICC) of 0.77 with a 95% confidence interval [35].

Quality of life questionnaire

The quality-of-life questionnaire related to the health of older people or the 15D tool is a general, comprehensive, multidimensional (15 fields), standardized, and self-report questionnaire that examines the condition of vision, hearing, respiratory system, movement, sleep, mouth and teeth, and speech. It deals with excretory status, self-care, mental function, discomforts and symptoms of illness, depression, anxiety, vitality, and sexual activities of older people [36]. This questionnaire was translated into Farsi by Heydari et al. (2021), and its psychometric steps were completed. Cronbach's alpha coefficient of the quality-of-life questionnaire was 0.92% [28]. The score of the tool is reported in two ways: single index score and profile measure graph scale. Each area is classified into five levels from "no problem" to "maximum problem". The overall score of 15D is calculated from the average of the total score related to all areas. and the range of the overall quality of life score related to health or any of the areas is between 0–1, the higher the score, the better the physical condition of older people [37]. According to the methodology mentioned by Sintonen (1995), the 15D score [38] was:

- Mobility (1 = 1) (2 = 0.7129) (3 = 0.4729) (4 = 0.2526) (5 = 0.0780).
- Vision (1 = 1) (2 = 0.7840) (3 = 0.4901) (4 = 0.3137) (5 = 0.1089).
- Hearing (1 = 1) (2 = 0.7497) (3 = 0.4611) (4 = 0.2353) (5 = 0.1003).

- Breathing (1 = 1) (2 = 0.6976) (3 = 0.4771) (4 = 0.2581) (5 = 0.0879).
- Sleeping (1 = 1) (2 = 0.7615) (3 = 0.5124) (4 = 0.3015) (5 = 0.1115).
- Eating (1 = 1) (2 = 0.6462) (3 = 0.4267) (4 = 0.1984) (5 = 0.0710).
- Speech (1 = 1) (2 = 0.7033) (3 = 0.4322) (4 = 0.2471) (5 = 0.1298).
- Elimination (1 = 1) (2 = 0.6845) (3 = 0.3958) (4 = 0.1764) (5 = 0.0558).
- Usual Activities (1 = 1) (2 = 0.7210) (3 = 0.4133) (4 = 0.2182) (5 = 0.0785).
- Mental Function (1 = 1) (2 = 0.6434) (3 = 0.3750) (4 = 0.1956) (5 = 0.0489).
- Discomfort and Symptoms (1 = 1) (2 = 0.7024) (3 = 0.3960) (4 = 0.2083) (5 = 0.0617).
- Depression (1 = 1) (2 = 0.7651) (3 = 0.5148) (4 = 0.3053) (5 = 0.1576).
- Distress (1 = 1) (2 = 0.7251) (3 = 0.4786) (4 = 0.2633) (5 = 0.1255).
- Vitality (1 = 1) (2 = 0.7713) (3 = 0.5152) (4 = 0.2957) (5 = 0.1253).
- Sexual Activity (1 = 1) (2 = 0.7095) (3 = 0.4424) (4 = 0.2486) (5 = 0.1318).

Other variables

Polypharmacy (number of 5 medications and more used by older person), Demographic variables (age, gender, education, number of doctors visiting older people, Disease history).

To calculate PIMs in this study, the Beers criterion was used, which was examined as an independent variable. Comorbidity was also examined as an independent variable. In this study, the quality of life of the older people was an outcome variable. Other variables (polypharmacy and demographic variables) were examined as confounding variables.

Statistical analysis

The data were analyzed using SPSS version 20 (IBM Corp. (2011). IBM SPSS Statistics for Windows (Version 20.0) [Computer software]. Armonk, NY: IBM Corp). Normality of continuous variables was checked using Kolmogorov–Smirnov test and Q-Q plot. Numerical variables were reported as means and standard deviations (SD); categorical variables as numbers (percentages). Categorical variables were compared between groups using a chi-squared test and continuous variables using an independent samples t-test or one-way analysis of variance (ANOVA). Pearson correlation coefficient was used for bivariate association analysis and linear regression were used to evaluate the association between PIM and comorbidity index as predictor variables with quality of life as dependent variable in crude (unadjusted) and adjusted models (adjustment was made for potential confounders).

Ethical consideration

The study received approval from Isfahan University of Medical sciences Ethics Committee (Research Proposal Code:3,401,529, and Ethical Code: IR.MUI.RESEARCH.REC.1401.291). The informed consent was obtained from all study participants. All steps of study were conducted in strict adherence to the ethical standards of Helsinki Declaration.

Results

This study included 500 older adults aged 60 to 90 years. The mean age of participants was 66.34 ± 5.67 years. The average number of medications consumed was 3.92 ± 2.63 (median: 4; interquartile range: (Q1:2, Q3:5). The most common diseases among the study population were hyperlipidemia (49.2%), hypertension (43.6%), and diabetes (35.4%). According to our findings, 36.8% of participants who took five or more medications experienced polypharmacy. More details about other demographic characteristics of study participants have been presented in Table 1.

Based on the 2019 Beers criteria, the prevalence of potentially inappropriate medication (PIM) use among participants was 61.2%. The most commonly used potentially inappropriate medications were painkillers (36.8%), followed by gastrointestinal medications (23.6%), nervous system medications (23.2%), endocrine medications (10.2%), anticholinergic medications (1.2%), and cardiovascular medications (0.6%). There were no cases of anti-thrombosis, anti-infection, and reproductive system medications. The highest PIM consumption was observed in individuals aged over 75 years and among females. However, no significant association was found between PIM use and age, gender, or education level among participants. Still, the use of these medications was significant with the number of doctors, so with the increase in the number of doctors, the use of these medications also increased in older people. (Table 2).

The mean and standard deviation of the Charlson Comorbidity Index score in this study was (3.63 ± 1.40), which had a significant relationship with age and number of doctors, and had an insignificant relationship with the variables of gender and education level (Table 2).

According to the findings of this study, the mean and standard deviation of the quality-of-life score related to the health of older people was (0.86 ± 0.08). the strongest area was related to routine self-care and vision status of older people, and the weakest area was related to

Table 1 Demographic characteristics of study participants

Variable	Variable levels	Frequency (%)
Sex	Male	223(44.6)
	Female	227(55.4)
Education	Less educated	220(44)
	Diploma (12-year formal education)	156(31.2)
	Associate degree	37(7.4)
	Bachelor's degree	73(14.6)
	MSc	10(2)
	Ph. D	4(0.8)
Number of doctors who visit older people participant	01-Mar	233(46.6)
	04-Jun	203(40.6)
	> 7	64(12.8)
Disease history	Heart disease	150(30)
	Diabetes	177(35.4)
	Hypertension	218(43.6)
	Hyperlipidemia	246(49.2)
	Fatty liver disease	112(22.4)
	Nerve disease	86(17.2)
	Thyroid disease	68(13.6)
	Kidney Disease	39(7.8)
	Digestive Disease	26(5.2)
	Lung disease	51(10.2)
	Cancer	14(2.8)
	Connective tissue disease	12(2.4)
Polypharmacy	01-Apr	316(63.2)
	05-Aug	158(31.6)
	> 8	26(5.2)

the sleep status of older people. Also, the relationship between the mean score of the quality of life in older people with age, gender, number of doctors was significant, and with the level of education was not significant (Table 2).

This study found a significant association between polypharmacy and PIM use, quality of life, and comorbidity in older adults (Table 3).

Also, based on the results, the relationship between comorbidity and the use of PIMs was significant ($P=0.001$), so the mean comorbidity score of older people who used inappropriate medications was (3.93 ± 1.42), and the older people who did not use inappropriate medication; their mean comorbidity score was (3.14 ± 1.22).

There was a significant relationship between the mean quality of life score with the mean comorbidity and PIM consumption among older people ($P=0.001$). The score of the quality of life of older people who used PIM compared to other participants who did not use PIM based on demographic variables is given in Table 4. According to the findings, the correlation between the mean score of quality of life and comorbidity based on the Charlson index in older people was found to be equal to (r = -0.286 and $P=0.001$), and the relationship was significant (Table 4).

In an unadjusted linear regression analysis, the relationship between comorbidity and quality of life scores in older adults was significant, with a regression coefficient (standard error) of -0.013 (0.0025) ($P<0.001$). However, after adjusting for confounding variables, the relationship remained significant, with a regression coefficient (standard error) of -0.009 (0.0027) ($P<0.001$), indicating that higher comorbidity is associated with lower quality of life scores (Table 5).

Similarly, in a linear regression analysis, the relationship between PIM and quality of life scores in older adults was significant (coefficient: -0.044, standard error: 0.007, $P<0.001$), suggesting that higher PIM is associated with lower quality of life scores. After adjusting for confounding variables, the relationship remained significant, with a regression coefficient (standard error) of -0.03 (0.007) ($P<0.001$) (Table 5).

Table 2 PIM use, mean Charlson comorbidity index and mean quality of life score across categories of demographic variables of study participants

Variable		PIM[a] Use *n* (%)	*P* Value**	Comorbidity score	*P* Value**	quality of life score	*P* Value**
Age	< 65 years	107(57.8)	0.488	3.40 ± 1.32	< 0.001	0.86 ± 0.07	< 0.001
	65–70 years	105(60.7)		3.17 ± 1.20		0.87 ± 0.07	
	70–75 years	67(65.7)		4.18 ± 1.17		0.87 ± 0.08	
	> 75 years	27(67.5)		5.25 ± 1.48		0.80 ± 0.1	
Sex	Male	129(57.8)	0.167	3.74 ± 1.45	0.108	0.88 ± 0.07	< 0.001
	Female	177(63.9)		3.54 ± 1.34		0.85 ± 0.08	
Education	Less educated	135(61.4)	0.84	3.69 ± 1.4	0.414	0.85 ± 0.09	0.09
	Diploma[b]	99(63.5)		3.48 ± 1.45		0.87 ± 0.07	
	Associate Degree	24(64.9)		3.54 ± 1.16		0.88 ± 0.07	
	Bachelor's degree	41(56.2)		3.69 ± 1.36		0.87 ± 0.07	
	MSc	5(50)		4.1 ± 1.37		0.87 ± 0.05	
	Ph.D	2(50)		4.5 ± 1.73		0.93 ± 0.01	
Number of Doctors	1–3	101(33)	< 0.001	3.24 ± 1.19	< 0.001	0.88 ± 0.07	< 0.001
	4–6	156(76.8)		3.77 ± 1.39		0.86 ± 0.07	
	> 7	49(76.6)		4.59 ± 1.60		0.81 ± 0.09	

Data are mean ± SD for continuous and number (%) for categorical variables

** *P*-value are resulted from independent samples t-test or ANOVA for continuous variables and chi-square for categorical variables

[a] Potentially Inappropriate Medication

[b] Diploma = 12-year formal education

Table 3 The relationship between polypharmacy and PIM, comorbidity and quality of life in study participants

Variable	PIM[a]Use		*P* Value	Comorbidity	*P* Value	Quality of Life	*P* Value**
	Yes *n* (%)	No *n*(%)					
Polypharmacy							
Yes	168(91.3)	16(8.7)	< 0.001	4.3 ± 1.41		0.75 ± 0.15	0.005
No	138(43.7)	178(56.3)		3.22 ± 1.22		0.79 ± 0.16	

Continuous data as mean ± SD and categorical data as frequency (percentage)

** *P*-values were obtained from the chi-square test or the independent samples t-test

[a] Potentially Inappropriate Medication

Table 4 Association of PIM use and comorbidity with total quality of life score in study participants

Variable	PIM Use		*P* value*	CCI	*P* value*
	Yes (*n* = 306)	No (*n* = 194)			
Quality of life score total (Qt)	0.85 ± 0.08	0.90 ± 0.08	**< 0.001**	-0.286[a]	**< 0.001**

Data are mean ± SD

* The *p*-value were obtained from the independent samples t-test and correlation analysis

[a] Pearson correlation

Discussion

Our study showed that more than half of the older adult population in Iran (61.6%) had at least one potentially inappropriate medication in their daily medication list based on the 2019 Beers criteria. The most commonly used inappropriate medications were, in order, painkillers, gastrointestinal drugs, and neurological medications. A study conducted in Qatar using the Beers criteria reported a 60.7% prevalence of PIMs among older adults in a primary healthcare center. The most common inappropriate medications were gastrointestinal drugs (84.2%), pain medications (49.9%), and central nervous

Table 5 Linear regression analysis of the association between PIM and comorbidity with Quality of life

Predictors		Regression coefficient (standard error)	95% confidence	Standardized coefficient	*P* Value
PIM (Use versus not Use)	Unadjusted	- 0.044(0.007)	(- 0.055 _—0.026)	-0.135	**< 0.001**
	Adjusted[a]	- 0.03(0.007)	(- 0.044 _—0.016)	-0.06	**< 0.001**
Comorbidity	Unadjusted	- 0.013(0.0025)	(- 0.018 _—0.018008)	-0.117	**< 0.001**
	Adjusted[a]	- 0.009(0.0027)	(- 0.004 015 _—0.004)	-0.074	**< 0.001**

[a] Adjusted regression coefficients for potential confounders including age, sex, number of doctors

system drugs (10.4%) [39]. In a study conducted in Saudi Arabia among older adults in an outpatient center, the prevalence of PIMs was reported to be 60.4% in 2019. The most commonly used inappropriate medications were analgesics, gastrointestinal drugs, and endocrine medications [40]. A study among older adults in Turkey, the prevalence of PIMs based on the Beers criteria was reported to be 42%, with the most common PIMs being gastrointestinal medications [41]. The prevalence of PIMs in a study conducted in Jordan was reported to be 49.2%. The most commonly used medications in this study were gastrointestinal drug [42].

The difference in the prevalence of PIM reported in different studies may be due to differences in the characteristics of older people, the type of diseases, different patterns of medication administration, the availability of medications listed in the 2019 Beers criteria, and also the lack of awareness among physicians about the existence of a list of inappropriate medications for older people, which may have led to the difference in the prevalence of PIM.

The Charlson Comorbidity Index score among older adults in our study was 3.63 ± 1.40, with the most common diseases being hypertension, hyperlipidemia, and diabetes, respectively. This could be due to the fact that most participants in this study were older adults, who typically present with a common cluster of diseases [14]. These comorbidities usually require the use of several medications to manage their conditions. The index showed a significant association with age, gender, and the number of physicians involved in patient care.

In this study, older adults with higher comorbidity scores used more potentially inappropriate medications. A study in the United States reported that patients with two or more comorbidities used potentially inappropriate medications (PIMs) more frequently [15].

The average health-related quality of life in our study was at a good level, and the strongest domains were related to daily self-care and vision status. This may be because the average age of the older adults in this study was relatively low, and the participants were mainly from the younger older adults' group, who are generally less susceptible to age-related frailty.

Additionally, the weakest domain of quality of life was related to sleep status, which was likely due to physical pain, as the most commonly used medications among the older adults in this study were painkillers, which suggests that physical pain may have affected their sleep quality.

In this study, using a linear regression model, it was observed that the quality of life of older people is related to the use of PIMs and comorbidity. Studies related to our study include:

An Iranian study on older adults with diabetes reported that the most common comorbidities were dyslipidemia and chronic obstructive pulmonary disease (COPD). The strongest domains of quality of life were related to mobility and self-care, while the weakest domains were associated with anxiety and depression. Additionally, the average health-related quality of life scores showed a direct relationship with the presence of comorbidities in older adults [43]. Another study in India reported a direct relationship between potentially inappropriate medications (PIMs) prescribed for older adults, their comorbidities, and their quality of life, such that an increase in these factors was associated with a decline in their quality of life [44].

A study among older adults in Malaysia showed that the average health-related quality of life score, measured using the EQ-5D tool, was 0.734 ± 0.214, with pain and discomfort being the weakest domain. Additionally, no statistically significant association was found between health-related quality of life and the use of potentially inappropriate medications (PIMs). This difference in the results of various studies is likely due to the use of different tools to assess the condition of older adults and the differences between community-dwelling older adults and those hospitalized [45].

Conclusions

This investigation underscores the pressing need to curtail unnecessary PIM consumption and the prevalence of common comorbidities, offering a knowledge foundation for health sector stakeholders aimed at enhancing older people's life quality. The findings inform policymakers to implement effective interventions in medication therapy management, screening for conditions such

as hyperlipidemia, hypertension, and diabetes in old age, and establishing a comprehensive family doctor system throughout the country. Additionally, training for doctors on the list of inappropriate medications for older people is recommended.

This study does have its limitations; it focused solely on older people under the care of health centers, so results may not be universally applicable. Confounding factors such as patient attitudes, prescribing factors, and lifestyles influencing quality of life were not measured or analyzed. Future studies with larger sample sizes and across multiple regions are suggested.

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Authors' contributions
M.S. Collecting data and wrote the main manuscript text M.R. Preparation of tables and final editing of the text A.W. performed the statistical analysis of the data All authors reviewed the manuscript.

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Data availability
The datasets used and/or analyzed during this study are available from the corresponding author.

Declarations

Ethics approval and consent to participate
The study received approval from the Isfahan University of Medical Sciences Ethics Committee (Research Proposal Code:3401529, and Ethical Code: IR.MUI.RESEARCH.REC.1401.291). The informed consent was obtained from all study participants. All steps of study were conducted in strict adherence to the ethical standards of Helsinki Declaration.

Competing interests
The authors declare no competing interests.

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