



The Relation between Using Inappropriate Medications and Quality of Life Among the Elderly Living in Kerman

Vida Kardanmoghaddam¹, Leila Vali¹, Narges Khanjani², Kourosh Rajabkhah³, Moslem Taheri Soodejani⁴, Mohammadreza Amiresmaili^{1*}

¹Research Center for Health Services Administration, Institute of Future Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

²Neurology Research Center, Kerman University of Medical Sciences, Kerman, Iran

³Health Technology Assessment Group, Deputy of Treatment, Ministry of Health and Medical Education, Tehran, Iran

⁴Center for Healthcare Data Modeling, Departments of Biostatistics and Epidemiology, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Abstract

Background: Disability induced by severe diseases reduces life quality among elders, and leads to increased use of medications and increase in drug misuse. This study was done to determine the relation between the number of inappropriate medications used and life quality of elderly people living in Kerman during 2014.

Methods: This descriptive and analytical cross-sectional study was conducted on 150 elderly people in Kerman, Iran. The participants were selected by simple random sampling. The elderly health assessment questionnaire and Beers Criteria were used for data collection. Data were analyzed using SPSS (version 16) and running χ^2 test, Fischer's exact test, and logistic regression. The model fitness was evaluated by the Hosmer and Lemeshow test.

Results: The risk of low life quality in elders using 3 to 4 inappropriate medications was 9.98 times more than elders using no unauthorized medication. The most frequent inappropriate medications were aspirin and alprazolam. A significant relation was observed between low life quality and number of inappropriate medications used by elders; that is, taking a higher number of inappropriate medications was associated with lower life quality.

Conclusion: Many elderly people use inappropriate medications, which can have a serious adverse impact on their quality of life.

Keywords: PIM list, Elders, Inappropriate medications, Life quality, Kerman

Citation: Kardanmoghaddam V, Vali L, Khanjani N, Rajabkhah K, Taheri Soodejani M, Amiresmaili M. The relation between using inappropriate medications and quality of life among the elderly living in Kerman. *Health Dev J.* 2022;11(1):9–17. doi:10.34172/jhad.2022.92062

Received: August 1, 2022, **Accepted:** October 5, 2022, **ePublished:** October 12, 2022

Introduction

The dramatic increase in average life expectancy during the 20th century is a big achievement (1). Global population ageing is one of the most notable social transformations of the twenty-first century. Aging is a biological process that all living creatures, including human beings experience. The advances in medical knowledge and technologies in today's world have increased life expectancy and the number of elderly people. Currently, the rapid increase of the aged population has highlighted issues related to this age group. Generally, with increase in age, the likelihood of illnesses and incapability increases. These negative effects increase the elderlies need for help, affect their independence and reduce their quality of life (QoL) (2). Today, for the first time in history, most people can expect to live into their sixties and beyond. By 2050, the

world's population aged 60 years and older is expected to reach 2 billion. Now, 125 million people are aged 80 years or older. By 2050, there will be almost this many (120 million) living in China alone, and 434 million people in this age group worldwide. By 2050, 80% of all older people will live in low- and middle-income countries (1). Currently, the elderly population of Iran is 8.2% of the total population (3,4).

According to international estimates, in the coming years the elderly population of Iran will have a faster growth than the rest of the world and even the world average; and by 2045, Iran will overtake the average global population growth rate for the elderly and five years later will also surpass that of Asia (3). By the middle of the century many By the middle of the century, many countries, e.g, Chile, China, the Islamic Republic of Iran



and the Russian Federation will have a similar proportion of older people to Japan, in which 30% of the population are already over 60 years old (1).

One of the measurable indicators that can be used to determine and improve the needs and health conditions of the elders is QoL. Studying health-related QoL has become one of the important areas of geriatric research and is regarded as one of the key indicators for assessing the efficacy of therapeutic and care interventions (5). QoL is a multi-dimensional concept that reflects the level of satisfaction and the current functioning of the individual (6). The World Health Organization (WHO) defines QoL as “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns”. Assessment of health related quality of life (HRQoL) has become one of the important research outcomes and is one of the important indicators of intervention efficacy (7).

Elderly people suffer from more illness and disability and consume more drugs in comparison with young people (8). Polypharmacy among older adults is common and consequently older patients are at higher risk of potentially inappropriate medications (PIMs) use. PIMs are considered one of the commonly encountered medication-related problems among the older population. The use of PIMs is commonly evaluated using different scales and criteria such as the Beers criteria, which are a set of explicit criteria to identify PIMs. The Beers’ criteria was first developed in 1991 and consequently updated with the latest update in 2015 (9). The estimated prevalence of PIMs among older patients is high and more than one-third of the older population are found to be prescribed at least one PIMs or been exposed to a PIM (10-12). In the Middle East, the prevalence of PIMs is very high where two studies conducted in Qatar and Lebanon found that 38.3% and 45.2% of older patients were prescribed PIMs respectively (13,14). In Saudi Arabia, the prevalence of PIMs use among older adults was assessed by two studies. The first study had identified the PIMs that should be avoided in older patients using 2003 Beers criteria (15). This study reported that 43% of the older adults used at least one PIM, 18% had used two PIMs and 38.4% had used three or more PIMs. The second study was carried among older patients who visited family medicine clinics and patients who received home health care (16).

The results of Steven’s research in 2016 showed that in general, 37.2% of the elderly in six Canadian provinces (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and Prince Edward Island) consumed at least one inappropriate drug. The highest prevalence of prescribing inappropriate drugs was 40.7% in Alberta, whereas the lowest rate was 29.2% in Prince Edward Island (17).

Inappropriate medications are drugs with higher risks than benefits, while safe alternatives are available. Taking

inappropriate drugs can lead to adverse drug reactions (18).

In several studies, the prevalence of using inappropriate medications among elders was estimated to be between 12% to 40% (18,19).

In the elderly, two thirds of unwanted side effects are caused by consumption of drugs such as corticosteroids, non-steroidal anti-inflammatory drugs, cardiovascular drugs, and psychotropic drugs (20).

Vali estimated that 20.75% of the elderly in Tehran consumed inappropriate drugs; and the most commonly used drugs were benzodiazepines (49.98%). Their findings showed that the use of inappropriate drugs among the elderlies of Iran is higher than many other countries and the use of such drugs exposes the elderlies to adverse drug reactions (8).

Apart from the economic and social issues of the aging phenomenon, aging has caused disease patterns to change to chronic diseases such as cardiovascular disease, cancer, high blood pressure, and diabetes (7).

Considering the importance of QoL in this group, there is a need for innovative planning and modifications in the country’s policies and programs. This can be achieved through focusing on elders’ empowerment and enhancing their health and welfare (5). The aim of this research was to determine the relation between QoL and taking inappropriate medications among elders living in Kerman, Iran.

Methods

The present descriptive and analytical, cross-sectional study was conducted on all elders discharged from Kerman University hospitals during the first six months of 2013. The addresses of elders were found using their hospital medical records. Simple random sampling was conducted to select the participants.

Ethical approval was obtained from the Ethics Committee of Kerman University of Medical Science (Ethics No. IR.KMU.REC.1393.549). Before initiating the study, all participants were informed about the objectives of the study and informed consent was obtained from all the participants. Some participants were living in other cities and had provided their children’s address in Kerman at the time of discharge.

The inclusion criteria included residence of the elderly in Kerman and age ≥ 60 years. In case an elderly did not want to cooperate in the study, he/she was excluded.

The interviews were done in the participants’ house by a trained interviewer. The interviewer recoded participants’ demographic information and completed the questionnaire. In addition, information about the medications taken by each participant, the insurance booklet, shells and boxes of medications were recorded.

The consumed drugs might have minor or severe side effects for the elderly based on their type and category. The Beers’ criteria were re-evaluated and updated in

2003 (Supplementary file 1: Table S1); and consists of 48 medicines and categories (21).

The validity of the standard questionnaire (the Nottingham Health Profile, NHP) (Supplementary file 2: Table S2) used in the current study was confirmed in previous studies (7). The Cronbach's Alpha of the NHP questionnaire was 0.938 (8). The NHP questionnaire includes 38 questions in six dimensions designed to evaluate the perception of health by each individual. In addition, it is used as a standard tool for investigating health problems in the society.

The number of questions in each dimension includes physical mobility (8 questions), pain (8 questions), sleep (5 questions), energy (3 questions), emotional reactions (9 questions), and social isolation (5 questions). Response to each question is "yes or no". 1 is considered for a positive answer and 0 for a negative answer. The weight of scores for each question in each dimension is so that the total scores of questions in each dimension is 100; and higher scores show lower health levels. The mean value of QoL aspects was calculated. Scores ≥ 45.22 indicated undesirable and scores < 45.21 indicated desirable QoL (17).

Chi-square test, Fisher's exact test, and logistic regression were run for determining the relation between QoL and the consumption of inappropriate medications. Model fitness in logistic regression was evaluated by the Hosmer and Lemeshow test.

The calculated sample size used to assess the QoL of the elderly in this study was at least 101 participants, and was calculated based on the standard deviation of 10.22 (22) and the acceptable error of 2%. After completing the Beer's criterion checklists by the participants, data were analyzed using SPSS (version 16).

Results

The demographic characteristics of participants have been shown in Table 1. 150 elderly people participated, 77 persons were women and 73 were men. The mean age of the participants was 72.8 ± 8.04 years (Supplementary file 3: Table S3).

The findings showed that 71.3% of the elderly consumed inappropriate drugs and 46.7% used more than one inappropriate drug. Considering side effects, 95.3% of the consumed drugs could exert severe complications in the elders.

The frequency of the components of total QoL in the elderly according to participants' demographic characteristics is showed in Table 2. According to Table 2, logistic regression analysis was used and showed that physical mobility in the elderly had a significant relation with gender, age, and marital status. Desirable physical mobility was more in men than women ($P=0.03$). Moreover, it had the highest frequency among elderly who were between 60-70 years old than others ($P=0.001$). It was also more frequent among married

Table 1. The demographic characteristics of elders who participated in this study

Variable		No.	%
Gender	Female	77	51.3
	Male	73	48.7
Age	60-70 years	67	44.7
	71-80 years	58	38.7
	>80 years	25	16.7
Marital status	Married	89	60.5
	Widowed	58	39.5
Education	Illiterate	99	66
	Elementary school education	39	26
	High school diploma or higher	12	8
Job	Unemployed	49	32.7
	Retired	38	25.3
	Self-employed	34	22.7
	Housewife	29	19.3

participants ($P < 0.001$).

Moreover, there was a significant relation between the relative frequency of pain and age ($P=0.006$) and marital status ($P=0.04$). With increase in age, the frequency of unfavorable pain increased ($P < 0.001$). Furthermore, the severity of pain in older people whose spouses had died was higher than the elderly who lived with their spouses ($P=0.04$).

As seen in Table 2, there was a significant relation between the elder's age and their quality of sleep; and a higher percentage of elderly people older than 80 years old had unfavorable sleep quality ($P=0.04$). Also, the elderly whose spouses had died had worse sleep quality compared to elderly people living with their spouses ($P=0.05$). A higher percentage of unemployed or self-employed elderly people had unfavorable quality of sleep ($P=0.03$). Other variables were not significantly related to quality of sleep.

Females had a more unfavorable situation than the males in the energy component and this difference was significant ($P=0.03$). Energy was significantly related to age and older people had less energy ($P=0.004$). The elderly whose spouse had died, had significantly more unfavorable conditions in the energy component compared to the elderly who lived with their spouses ($P < 0.001$).

As Table 2 shows, social isolation was more remarkable in women ($P=0.02$), those aged > 80 years ($P < 0.001$), the elderly whose spouse had died ($P < 0.001$), and the elderly who were housekeepers ($P=0.02$). There was a significant relation between emotional reactions and educational level ($P=0.05$) and job ($P=0.03$). That is, the prevalence of undesirable emotional reactions was significantly higher among illiterate people than people with elementary education. More unemployed elderly had unfavorable emotional reactions.

Table 2. Comparison of the relative frequency of components of QoL in the elderly according to gender, age, marital status, education, and Job

Variable		Gender		Age (years)			Marital status			Education			Job			
		Female	Male	70-60	71-80	>80	Married	Widowed	Illiterate	Elementary school education	High school diploma or higher	Unemployed	Retired	Self-employed	Housewife	
Physical mobility	Desirable No. (%) (0-45.21)	32 (41.6)	43 (58.9)	47 (67.5)	24 (41.4)	6 (24)	57 (64)	18 (31)	47 (47.5)	23 (59)	5 (41.7)	20 (40.8)	22 (57.9)	21 (61.8)	12 (41.4)	
	Undesirable No. (%) (45.22-100)	45 (58.4)	30 (41.1)	22 (32.8)	34 (58.6)	19 (76)	32 (36)	40 (69)	52 (52.5)	16 (41)	7 (58.3)	29 (59.2)	16 (42.1)	13 (38.2)	17 (58.6)	
Pain	Desirable No. (%) (0-45.21)	37 (48.1)	38 (52.1)	41 (61.2)	28 (48.3)	6 (24)	51 (57.3)	23 (39.7)	50 (50.5)	19 (48.7)	6 (50)	25 (51)	21 (55.3)	16 (47.1)	13 (44.8)	
	Undesirable No. (%) (45.22-100)	40 (51.9)	35 (47.9)	26 (38.8)	30 (51.7)	19 (76)	38 (42.7)	35 (60.3)	49 (49.5)	20 (51.3)	6 (50)	24 (49)	17 (44.7)	18 (52.9)	16 (55.2)	
Sleep	Desirable No. (%) (0-45.21)	37 (48.1)	42 (57.5)	41 (61.2)	30 (51.7)	8 (32)	53 (59.6)	25 (43.1)	49 (49.5)	22 (56.4)	8 (66.7)	19 (38.8)	27 (71.1)	17 (50)	16 (55.2)	
	Undesirable No. (%) ((45.22-100)	40 (51.9)	31 (42.5)	26 (38.8)	28 (48.3)	17 (68)	36 (40.4)	33 (56.9)	50 (50.5)	17 (43.6)	4 (33.3)	30 (61.2)	11 (28.9)	17 (50)	13 (44.8)	
Energy	Desirable No. (%) (0-45.21)	32 (41.6)	43 (58.9)	38 (56.7)	32 (55.2)	5 (20)	58 (65.2)	17 (29.3)	44 (44.4)	25 (64.1)	6 (50)	22 (44.9)	25 (65.8)	18 (52.9)	10 (34.5)	
	Undesirable No. (%) (45.22-100)	45 (58.4)	30 (41.1)	29 (43.3)	26 (44.8)	20 (80)	31 (34.8)	41 (70.7)	55 (55.6)	14 (35.9)	6 (50)	27 (55.1)	13 (34.2)	16 (47.1)	19 (65.5)	
Social isolation	Desirable No. (%) (0-45.21)	37 (48.1)	49 (67.1)	47 (70.1)	33 (56.9)	6 (24)	69 (77.5)	17 (29.3)	51 (51.5)	27 (69.2)	8 (66.7)	26 (53.1)	29 (76.3)	20 (58.8)	11 (37.9)	
	Undesirable No. (%) ((45.22-100)	40 (51.9)	24 (32.9)	20 (29.9)	25 (43.1)	19 (76)	22 (22.5)	41 (70.7)	48 (48.5)	12 (30.8)	4 (33.3)	23 (46.9)	9 (23.7)	14 (41.2)	18 (62.1)	
Emotional reactions	Desirable No. (%) (0-45.21)	35 (45.5)	40 (54.8)	34 (50.7)	31 (53.4)	10 (40)	49 (55.1)	26 (44.8)	43 (43.4)	23 (59)	9 (75)	16 (32.7)	22 (57.9)	19 (55.9)	18 (62.1)	
	Undesirable No. (%) ((45.22-100)	42 (54.5)	33 (45.2)	33 (49.3)	27 (46.6)	15 (60)	40 (44.9)	32 (55.2)	56 (56.6)	16 (41)	3 (25)	33 (67.3)	16 (42.1)	15 (44.1)	11 (37.9)	
Life quality	Desirable No. (%) (0-45.21)	32 (41.6)	43 (58.9)	42 (62.7)	28 (48.3)	5 (20)	56 (62.9)	19 (32.8)	44 (44.4)	23 (59)	8 (66.7)	20 (40.8)	25 (65.8)	18 (52.9)	12 (41.4)	
	Undesirable No. (%) ((45.22-100)	45 (58.4)	30 (41.1)	25 (37.3)	30 (51.7)	20 (80)	33 (37.1)	39 (67.2)	55 (55.6)	16 (41)	4 (33.3)	29 (59.2)	13 (34.2)	16 (47.1)	17 (58.6)	

In general, a significant relation was found between QoL and gender ($P=0.03$), age ($P=0.001$), and marital status ($P<0.001$). In other words, QoL was lower in females and those who were older. The prevalence of unfavorable QoL was significantly higher among the elderly whose spouses had died than the elderly living with their spouses.

The frequency of the elderlies' life quality in terms of the number, and the severity and possible complications of inappropriate drugs is reported in Table 3.

According to Table 3, a significant relation was observed between QoL and the number of inappropriately consumed drugs among the elderly. The elderly who consumed 3 to 4 inappropriate drugs had more unfavorable QoL than those who took none or one inappropriate medication.

According to Table 4 and the results of one-way analysis of variance, the mean score of undesirable QoL in all dimensions except the energy dimension, was significantly different in various groups of inappropriate drugs use and was worse in groups that used more drugs ($P<0.05$). Undesirable physical mobility was observed in the elderly who took 3-4 drugs, which was higher than the elderlies who did not use any inappropriate medication, and this difference was statistically significant ($P=0.02$). In addition, significant differences were observed in the frequency of pain, sleep, social isolation, and emotional reactions of the elderly according to the number of possible complications of inappropriate drug use ($P<0.05$).

The results of logistic regression in Table 5 show that

Table 3. Comparison of the frequency of total QoL in the elderly according to the number and severity of possible complications of inappropriate drugs

Inappropriate drug indicators		QoL indicators		p value
		Undesirable (%)	Desirable (%)	
The number of improper used drugs	0	(37.2) 16	(62.8) 27	0.01
	1	(48) 24	(52) 26	
	2	(52.4) 22	(47.6) 20	
	3-4	(86.7) 13	(13.3) 2	
The severity and possible side effects of inappropriate used drugs according to the Beers' criteria	Low	(20) 1	(80) 4	0.11*
	High	(56.9) 58	(43.1) 44	

*Fisher's exact.

Table 4. The mean score of life quality and its components among the elderly in terms of the number of inappropriate medication use

Variable	Number of inappropriate drugs	Mean	Standard deviation	P value
Physical mobility	0	45.48	28.50	0.02
	1	46.80	26.48	
	2	47.67	22.95	
	3-4	68.86	36.85	
Pain	0	45.54	28.61	0.04
	1	44.32	30.18	
	2	40.11	33.82	
	3-4	64.54	25.77	
Sleep	0	35.31	29.55	0.05
	1	44.03	27.27	
	2	48.41	27.91	
	3-4	57.80	35.21	
Energy	0	53.73	39.51	0.09
	1	53.60	36.25	
	2	54.22	36.77	
	3-4	79.89	31.59	
Social isolation	0	29.79	28.61	0.02
	1	39.32	30.84	
	2	41.25	34.40	
	3-4	59.02	32.50	
Emotional reactions	0	43.89	43.89	0.01
	1	47.92	47.92	
	2	51.66	51.66	
	3-4	70.63	70.63	
Life quality	0	42.29	23.50	0.005
	1	46	21.76	
	2	47.22	22.98	
	3-4	66.79	23.32	

participants who used 3 to 4 inappropriate medications had the chance of experiencing an undesirable life quality, 9.98 (95% CI: 1.89-52.57) times more than those who used no inappropriate medications.

Furthermore, the odds of having low life quality was 1.89 (95% CI: 0.92-3.91) and 8.2 (95% CI: 2.4-26.7) times higher in elderly people aged between 71-80 years and those aged over 80 years in comparison with the elderly aged 60-70 years, respectively. The results showed that the odds of having undesirable life quality was less (0.35, 95% CI: 0.15-0.864) among people who were retired compared to the unemployed. In addition, the odds of unfavorable life quality was less (0.477, 95% CI: 0.223-1.02) in the elderly with higher education than those who were illiterate.

Discussion

In the present study, the mean score of QoL in the elderly was 47.36 ± 23.53 from 100, and the QoL score of the elderly was generally favorable in Kerman. Regression analysis of the results indicated that QoL of the elderly had a significant relation with their age, gender, and marital status. In other words, with increase of age, the elderly had more unfavorable QoL. In similar studies about the effect of age on QoL, significant and inverse relations were found between age and QoL (23). Results of the current study are in line with results of other studies that reported total QoL is lower among the older seniors than the other age groups. A study in Australia showed that the elderly under 70 years of age had better health and QoL than those who were more than 70 years old (24). Obviously, the incidence of physical inability and moving limitations are more pronounced in older people, and this affects their QoL.

Moreover, the percentage of poorer self-rated health was higher in women compared to men. In the SABE study (Salud, Bienestar and Envejecimiento) in São Paulo, Brazil, 8.9% of women and 7.2% of men demonstrated poor health. In other SABE study countries, the participants reporting good/very good health ranged from 27.9% of women (Mexico) to 69.0% of men (Uruguay) (25). Women with good physical and psychosocial health are more likely to have a better QoL. For men, the best QoL was associated with high socioeconomic conditions and good physical and psychosocial health (26). In examining the relation between gender and life quality of the elderly, the results of similar studies indicate higher QoL scores for elderly men in all aspects of life quality (24,27-31). Some studies have shown a significant statistical difference for life quality, only in physical dimensions and social function which was more among men than women (30,32,33). However, in our study, in all aspects, the life quality scores of the elderly men were higher than those of the elderly women, which can be due to cultural and social factors of the community.

According to the results of this study, undesirable life quality was more prevalent among elderly people whose spouse had died and was significantly higher than the elderly who lived with their spouses. One of the

Table 5. Adjusted odds ratio for the predictors of Quality of Life among the elderly

Variables		OR (95% Confidence Interval)	P value
Inappropriate used drugs(count)*	0	1	-
	1	1.39 (0.58-3.34)	0.46
	2	1.83 (0.74-4.45)	0.20
	3-4	9.98 (1.89-52.57)	0.007
Gender	Female	1	-
	Male	0.796 (0.236-1.344)	0.196
Insurance	No	1	-
	Yes	0.287(0.047-1.756)	0.176
Education	Illiterate	1	-
	Elementary school education	0.509 (0.135-1.92)	0.319
	High school diploma or higher	0.477 (0.223-1.02)	0.056
Job	Unemployed	1	-
	Retired	0.35 (0.15-0.864)	0.02
	Self-employed	0.69 (0.281-1.69)	0.417
	Housewife	0.961 (0.38-2.48)	0.961
Age (years)	60-70	1	-
	70-80	1.89 (0.92-3.91)	0.083
	>80	8.2 (2.4-26.7)	0.001
Marital status	Widowed	1	-
	Married	1.7 (0.793-4.097)	0.159

*Variables (gender, insurance, education, job, age, marital status) adjusted.

social factors affecting QoL is partner support and the social networks people interact with them. The absence of this factor in the elderly whose spouse has passed away or those who live alone can affect their health and QoL. Therefore, social and support networks should be created for the elderly people. They should also be empowered adequately to face the complications caused by lack of these supportive networks. In Campos and colleagues' study, an inverse association was observed between QOL and family dysfunction. Men and women who were satisfied with their family relationship had 1.8 and 3.0 times higher odds of good QOL, respectively (26). Frequent contacts and visits with friends or family have been shown to motivate activity and increase self-rated QOL (26). Andersen showed that spouses have a decisive role in improving the satisfaction in elderly life (34). Furthermore, other studies have emphasized on the positive role of marriage in the QoL of individuals (23,24).

The findings of this research revealed that familial relationships and social support had a significant effect on QoL of the elderly. Therefore, particular attention should be paid to improve relationships in families with elderly members. Generally, with increase of age, the likelihood of developing diseases and incapability increases in the final years of life. This issue calls for

more attention to supportive factors and other basic variables to empower the elderly, make their lives more dynamic, and improve their QoL. The study of Tajvar et al showed that the socio-cultural conditions in Iran have made mental health status better than physical health, because in Iran the elderly receive special respect and have a highly respected position in their families (35). The cultural and religious background in Iran has not only prevented people from leaving the elderly, but has also encouraged the younger individuals to take care of them, while in the advanced societies this situation is less common. However, changes have occurred over time, such as the size of families, migration, and various problems leading the elderly to be transferred to nursing homes (36). Gallegos-Carrillo et al believed that the variety of social support networks and their effects on health is related to the culture. For example, in Mexico, family relationships are the most important type of social network (37). Moreover, a longitudinal study in western societies indicated that people who are members of the social support systems such as family, friends, and peers are healthier, have a longer life, and are more satisfied with their lives (38). The QOL of older adults could be good, or at least preserved, provided they have autonomy, independence and good physical health and provided they fulfill social roles, remain active and enjoy a sense of personal meaning (39). Living alone presents a greater risk of loneliness and isolation because loneliness increases as the social contacts of older individuals decrease (26). A study from Finland reported that more than one-third of the elderly suffered from loneliness (40).

In the relation between the elderly's level of education and their QoL, significant differences were observed; and the elderly with higher educations had higher average scores than the elderly with lower education levels. This confirms the findings that think education is an effective factor in creating a dynamic elderly life (24,27-30, 41).

In this study, uneducated and unemployed elderly people did not have a good QoL, although the difference with others was not statistically significant. These results are not in line with other studies, which did not show a lower QoL among uneducated and unemployed elderly people. The difference between the results of the current study and these studies is probably due to the different measurement tools and the community under study (41,42).

In the current study, a significant relation was found between undesirable life quality and the number of inappropriate medications taken by elders, so that elders who used 3 to 4 inappropriate medications had a much more undesirable life quality than elders who used no or 1 inappropriate medication.

A study on the demographic factors of the elderly discharged from the hospitals of Tehran showed that gender and income were associated with consumption of inappropriate drugs among the elderly. The findings

indicated that the elderly women (21.5%) more than men (11.8%) and the elderly without income (26.4%) more than the individuals with income (13.2%) used inappropriate drugs. The elderly who took more drugs, consumed more inappropriate medicines (28.6% vs. 12.2%). However, factors such as age, gender, marital status, occupation, and etc., did not have any relation with inappropriate use of drugs (7,41).

In another study, drug consumption was reported higher among the low-educated or illiterate older people than the educated ones (48.1% vs. 1.8%), because the former group lacked information on the consequences of taking medications, especially the inappropriate drugs. On the other hand, the elderly with higher education levels paid more attention to their health status, which resulted in less use of drugs, especially the inappropriate medications (7). The findings of this study were consistent with the present study. Excessive consumption of some medications, especially among the elderly increases the incidence of side effects. These side effects are sometimes very serious and can threaten the patient's life. Some of these side effects are unwanted and unavoidable.

In a study conducted by Laroche et al, it was found that women used inappropriate medications more than men; in addition, he found that old elderly people with low education took more inappropriate medications (43). However, a systematic literature review revealed inconsistent significant associations between age and gender with inappropriate prescriptions (44). This study showed that patients with high education level had significantly lower potential prescribing omissions compared to those with low and intermediate education levels. This may be due to the fact that participants with high education level had better healthcare information to help make appropriate health decisions (45).

In a study conducted on the elderly admitted to Slovakia hospitals, the use of various medications, depression, lack of mobility, and heart failure were recognized as factors associated with increased prescription of inappropriate medications; moreover, it was found that the prescription of inappropriate medications was less in elders over 74 years (18). In a study performed in Italy, the rate of prescribing inappropriate medications increased by increase in the length of staying in the hospital and the number of prescribed medications. The related factors associated with prescription of inappropriate medications were age > 85 years, the existence of cognitive impairment, and the number of various medications (46).

In another research, age > 80 years, the use of various medications, depression, and poor mental health were found to be risk factors for inappropriate medication prescription (47).

The literature has shown that taking multiple medications simultaneously in many cases, causes more severe and sometimes toxic effects in the elderly.

This is due to the physiological changes in the body, which change the quality of drugs, cause disorders in compensatory mechanisms of the body, and change the tissue response to the standard drug concentration.

Different rates have been reported for inappropriate use of drugs among the elderly population in different countries which may be due to different drug policies, different health care systems, and the health status of the elderly. One of the main objectives of the European Union is to improve measures, rules, and regulations throughout Europe and to coordinate the drug policies with regard to the use of inappropriate medications, such as abandoning ineffective or dangerous drugs, limiting drug administration for the elderly, prescribing safer drugs, and coordinating drug prescription guidelines. These strategies can help improve proper drug prescription among the elderly (48). The application of such a model can also be beneficial in Iran. One of the major problems with taking medicines in the elderly is its economic dimension. The comprehensive coverage of the elderly's drug costs brings a huge financial burden to the health care system since the cost of drug treatment for these people is increasing annually. There is, of course, another view that if drug therapy leads to non-hospitalization, reduction of the hospitalization period, better performance of the patient, and prevention of combined illnesses, it can bring down health care costs.

Conclusion

Considering the increase of the elderly population which is accompanied with various costs, including healthcare, paying attention and planning for this age group seems essential. One of the appropriate solutions to reduce these costs is paying attention to the life quality of the elderly and factors that affect their life quality such as social support. In addition, with regard to the growth of chronic and non-communicable diseases and population aging, training healthcare providers concerning the right concepts of medication therapy among the elderly, should be one of the priorities of medical, pharmaceutical, and nursing universities. Further, informing the consumers should also be considered. For example, pharmacists can inform elders about the medications that they should avoid. In this study, use of illegal drugs or over the counter drugs and the number of chronic conditions are not included.

Acknowledgements

This article was part of a Master's thesis and was financially supported by Kerman University of Medical Science and the Health Services Management Research Center, Institute for Future Studies, Kerman University of Medical Sciences, through Grant No.: 930449.

Authors' Contribution

Conceptualization: Leila Vali, Vida Kardan Moghaddam.

Data curation: Vida Kardan Moghaddam.

Formal Analysis: Narges Khanjani.

Funding acquisition: Mohammadreza Amiresmaili.

Investigation: Leila Vali, Vida Kardan Moghaddam.

Methodology: Narges Khanjani.

Project administration: Mohammadreza Amiresmaili.

Resources: Vida Kardan Moghaddam.

Software: Moslem Taheri Soodejani.

Supervision: Mohammadreza Amiresmaili.

Validation: Narges Khanjani.

Visualization: Narges Khanjani.

Writing—original draft: Vida Kardan Moghaddam, Kourosh Rajabkhah.

Writing—review & editing: Narges Khanjani, Vida Kardan Moghaddam, Kourosh Rajabkhah.

Competing Interests

The authors declare that they have no competing interests.

Supplementary Files

Supplementary file 1 contains Table S1.

Supplementary file 2 contains Table S2.

Supplementary file 3 contains Table S3.

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