

Original Article



Relationship Between Sleep Quality and Falls Among Elderly People in Amirkola, Northern of Iran

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Abstract

Background: Aging is considered a biological, natural, and inevitable phenomenon that is associated with common problems of sleep quality and falls. The aim of this study was to evaluate the relationship between sleep quality and falls among the elders of Amirkola.

Methods: In this case-control study, 250 elders, who were exposed to the falling, and 500 people without the previous falling were randomly selected during 2016-2017. The data were collected according to demographic and Pittsburgh Sleep Quality Index (PSQI) questionnaires.

Results: There was a significant relationship between sleep quality and falling, while no significant relationship was found between demographic characteristics (e.g., gender, marital situation, age, educational level, occupation, and satisfaction of income) and falling. The mean of chronic diseases was 3.65 ± 2.29 and 4.38 ± 2.75 in control and case groups, respectively ($P=0.0001$). A significant difference was found between the two groups regarding the number of falls during the last 12 months ($P=0.0001$). There was a significant positive correlation between the score of poor sleep quality and the number of chronic diseases ($P=0.001$, $r=0.352$), the number of falls during the last 12 months ($P=0.001$, $r=0.137$), and the number of falling during the last 12 months with the number of chronic diseases ($P=0.001$, $r=0.208$). There was a significant negative correlation between poor quality sleep with the score of physical activity ($P=0.001$, $r=-0.166$) and the number of chronic diseases with the physical activity score ($P=0.001$, $r=-0.259$). After adjusting the other variables, the number of chronic diseases ($P=0.002$, $OR=1.114$) and history of smoking ($P=0.018$, $OR=1.678$) were the most effective factors of falling. Finally, a direct positive correlation was observed between the total scores of sleep quality and falling in terms of gender in the older woman of Amirkola ($P=0.001$, $OR=2.080$).

Conclusion: Awareness of the factors of falls can help develop prevention strategies and appropriate health services.

Keywords: Accidental falls, Sleep, Aged, Elderly

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Introduction

Aging is one of the critical and crucial stages of human development, which is not only the end of life but also a natural and inevitable process (1). In today's societies, especially in developing countries, the advancement of medical knowledge, the use of technology and industry in human societies, and the improvement of nutrition have led to an increase in the elderly population (2). The number of elderly people in Iran is expected to reach more than 26 million by 2050 and could account for 30% of the total population; therefore, the increase in the elderly population is a global phenomenon that can turn into a crisis (3). Geriatric health is one of the main challenges in most societies, and sleep quality is an important indicator of health among the elderly. As we age, our sleep patterns,

rhythms, and structures undergo major quantitative and qualitative changes, and older people have many difficulties in healthy sleep and suffer from varying levels of sleep disorders (4). Epidemiological studies have also indicated that more than 70.3% of the elderly report sleep disorders (5). Improper sleep can also have consequences such as memory impairment, difficulty concentrating, dementia, physical dysfunction, increased risk of accidents, higher risk of falling, and increased mortality in the elderly (5,6). Falling is one of the most obvious and dangerous problems of older age, as well as the most common cause of injuries in the elderly. Falling can lead to immobility, decreased performance, hospitalization, increased treatment costs for the community, and higher mortality rates (7,8). According to the World Health



Organization, 7% of the world's population was elderly in 2000, while this percentage is projected to reach 16 in 2050 (9). Golmakani et al reported that approximately one-third of people over the age of 65 fall at least once a year, and this rate increases with age (10). The negative consequences of falling are associated with lower quality of life and increased time of hospitalization. The physical consequences of falling include pelvic fracture, disability, loss of physical ability, and death, and the psychological consequences are decreased self-esteem, fear of falling, reduced life expectancy, and financial loss. Thus, the most common and problematic issue of old age (i.e., falling) has become an important health concern in the elderly, which is accompanied by fear, limitation of daily activities, and in most cases, avoidance of movement. Falls and their injuries are a major problem for seniors around the world and lead to a significant increase in expenses and impose a burden on health care systems (11,12). Undoubtedly, falls are not a completely coincidental event; rather, they can be predicted and prevented by evaluating a number of risk factors (13). Preventing falls, helping to maintain balance in the elderly, and reducing the serious harm resulting from falls are among the priorities of most countries in geriatric care planning. Therefore, taking measures to avoid falls and their psychological consequences can be one of the important goals in caring for the elderly and healthy life in old age (14).

Considering that aging is inevitable and irreversible and because the health of the elderly is a health problem in most societies, dealing with these problems requires careful and correct policymaking and planning. Due to the growing trend of the elderly population following medical advances and the importance of sleep quality in older people, the complications and costs that the fall of the elderly imposes on individuals and society, this study investigated the relationship between sleep quality and falling of the elderly in Amirkola in Mazandaran Province, Iran.

Materials and Methods

The current case-control study was conducted on the elderly of Amirkola of Babol, Iran in 2016-2017. This study is part of the comprehensive project to study the health status of the elderly in Amirkola (Amirkola Health and Aging Project, AHAP) in the phase 2 AHAP. The samples were selected from the elderly who met the inclusion criteria. These criteria included the population of 60 years and older of Amirkola and the lack of cognitive impairments. On the other hand, the exclusion criteria were incomplete files, no response to more than 10% of the questions, and non-participation in completing the questionnaire. In this study, the case group included 250 elders who were exposed to the falling, while 500 people were randomly selected and assigned to the control group without the previous falling based on previous studies (15,16). The control group was matched in terms of age and gender. The study protocol was explained to the subjects, and informed consent was obtained from each person

before enrolling in the study. Demographic characteristics and Pittsburgh Sleep Quality Index (PSQI) questionnaires were used to collect data through interviews with the elderly or their relatives. In this study, data on falls were collected through a questionnaire including the history of falls during the last 12 months, the frequency of falls, and the need for hospitalization and medical care due to falls. Buysse et al measured the internal consistency of the Pittsburgh Sleep Quality Questionnaire using Cronbach's alpha of 0.83 (17). In addition, Farrahi et al estimated the reliability coefficients with Cronbach's alpha 0.89, as well as the sensitivity and specificity of 100% and 93%, respectively (18). This questionnaire contains 19 questions, and on each scale, the person's score is between 0 and three (no sleep problem: 0, moderate sleep problem: 1, serious sleep problem: 2, and very serious sleep problem: 3). Further, it has several subgroups such as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of the scores of the subscales is between 0 and 21. Achieving a total score higher than 5 in the whole questionnaire means poor sleep quality and a score of 0 to 5 is considered desirable sleep quality (17,18).

Data were analyzed by SPSS software (version 22) using chi-square, *t* test, Pearson correlation coefficient, and multivariate logistic regression, and $P < 0.05$ indicated statistical significance. Demographic variables were analyzed by descriptive statistics, including mean and standard deviation (SD) for quantitative variables and percentage for qualitative variables.

Results

The mean age (\pm SD) of the subjects was 70.50 ± 7.28 years (ranging from 60 to 93 years). Most of the elderly were housewives (49.1%), had a low level (44.3%) of income satisfaction, and were illiterate (62.9%).

There was a significant relationship between sleep quality and falling ($P = 0.008$). However, no relationship was found between gender, marital status, age, educational level, occupation, and satisfaction of income and falling. The average number of chronic diseases in the case and control groups was 4.38 ± 2.75 and 3.65 ± 2.29 , and this difference was highly meaningful in statistics ($P = 0.0001$). A significant difference was observed between the two groups with regard to the number of falls over the last 12 months. The case group had a higher number of falls in the last 12 months compared to the control group ($P = 0.0001$, Table 1). Based on the results, a significant direct correlation was detected between the score of bad quality of sleep with the number of chronic diseases ($P = 0.001$, $r = 0.352$) and the number of falls in the last 12 months ($P = 0.001$, $r = 0.137$), implying that the quality of poor sleep has increased with an increase in the number of chronic diseases and the number of falls in the last 12 months. Moreover, examining the correlation between the number of falls in the last 12 months with the number

Table 1. Comparison of Baseline Socio-demographic Characteristics of Older People Based on Falls in the AHAP, Iran (2016-2017)

Variable	Falling		P-value
	Yes Mean ± SD or No. (%)	No Mean ± SD or No. (%)	
Age (y)	70.48 ± 7.073	70.52 ± 7.39	0.94 ^a
Number of chronic diseases	4.38 ± 2.75	3.65 ± 2.29	0.0001 ^a
Number of falls in the last 12 months	2.13 ± 1.46	0.00 ± 0.00	0.0001 ^a
Physical activity score	94.23 ± 58.78	97.39 ± 55.83	0.473 ^a
Gender			
Male	125 (33.3)	250 (66.7)	1 ^b
Female	125 (33.3)	250 (66.7)	
Marital situation			
Single	55 (40.4)	81 (59.6)	0.052 ^b
Married	195 (31.8)	419 (68.2)	
Age			
60-64	58 (33.3)	116 (66.7)	
65-69	64 (33.3)	128 (66.7)	
70-74	62 (33.3)	124 (66.7)	1 ^b
75-79	30 (33.3)	60 (66.7)	
80-84	26 (33.3)	52 (66.7)	
85-99	10 (33.3)	20 (66.7)	
Educational level			
Illiterate	162 (34.3)	310 (65.7)	
Primary	48 (31.0)	107 (69.0)	0.150 ^b
Up to diploma and diploma	32 (39.0)	50 (61.0)	
University	8 (19.5)	33 (80.5)	
Occupation			
Unemployed	19 (36.5)	33 (63.5)	
Housewife	126 (34.2)	242 (65.8)	0.757 ^b
Worker and farmer	21 (27.6)	55 (72.4)	
Employed and retired	53 (31.7)	114 (68.3)	
Self-employed	31 (35.6)	56 (64.4)	
Satisfaction of income			
Very much	1 (33.3)	2 (66.7)	
Much	3 (23.1)	10 (76.9)	0.812 ^b
Medium	73 (31.9)	156 (68.1)	
Low	110 (33.1)	222 (66.9)	
Very little	63 (36.4)	110 (63.6)	
PSQI			
≤5	122 (29.3)	295 (70.7)	0.008 ^b
>5	128 (38.4)	205 (61.6)	

Note. SD: Standard deviation; PSQI: Pittsburgh sleep quality index; AHAP, Amirkola Health and Aging Project,

^aIndependent T test; ^bChi-square test.

of chronic diseases ($r=0.208$ and $P=0.001$) revealed a positive and significant correlation between these two factors. In other words, the number of falls over the last year represented an increase by increasing the score of the number of chronic diseases. There was a significant

negative correlation between poor quality sleep with the score of physical activity ($P=0.001$, $r=-0.166$) and the number of chronic diseases with the physical activity score ($P=0.001$, $r=-0.259$). More precisely, an increase in physical activity led to a decrease in the bad quality sleep and the number of chronic diseases. Furthermore, there was a tendency toward a significant negative correlation between physical activity and the number of falls in the past year ($P=0.053$, $r=-0.071$, Table 2). Multivariate logistic regression analysis of the backward model was used to investigate the role of variables affecting the falling. After adjusting for other variables, the number of chronic diseases ($P=0.002$, 95% CI=1.042-1.192, OR=1.114) and history of smoking ($P=0.018$, 95% CI=1.091-2.58, OR=1.678) had the most effect on falling (Table 3). There was a direct positive association between sleep quality and falling in terms of gender in the older woman of Amirkola ($P=0.001$, 95% CI=1.320-3.227, OR=2.080) but not in men ($P=0.302$, 95% CI=0.732-1.842, OR=1.161). Women with low sleep quality experienced 2.080-fold more falls than older people with high sleep quality (Table 4). Less than 50% of men in both case and control groups had a sleep quality score greater than 5. However, this was the opposite in women; in both control and case groups, more than 50% of older women had a sleep quality score of above 5. Additionally, the rate of falling was higher with the increase in the poor sleep quality score (Figure 1).

Discussion

The results of this study showed a significant relationship between sleep quality and falling, which is in line with the findings of Taheri Tanjani et al (19) and Na'emani et al (20). These researchers believed that falling is associated with poor sleep quality; however, our findings are not consistent with the results of Salarvand and Birjandi (21). Poor sleep quality or daytime sleepiness in the elderly is associated with impaired health, lower physical function, decreased quality of life, increased risk of mental illness, and higher mortality rates. Poor sleep quality can disrupt a person's feelings, thoughts, and motivations, increasing the risk of falling and injuries (20,22).

Based on the results, there was no significant correlation between gender, occupation, education level, and income satisfaction with falling. In the same studies, no association was found between the mentioned variables and the falls in the elderly (13,21,23). However, our findings contradict those of Bastani et al in terms of income (24). It should be noted that better economic conditions are expected to lead to fewer falls in the elderly, but one possible explanation for this finding is that satisfaction with the income status in the present study was similar in both case and control groups.

The findings of the present study indicated that there was no statistically significant relationship between marital status and falling, although the rate of falling among married older people was lower compared to single ones. Salarvand and Birjandi (21) found that

Table 2. The Inter Correlations of the Studied Quantitative Variables Among Older People in the AHAP, Iran (2016-2017)

	Quality of Sleep	Number of Chronic Diseases	Physical Activity	Number of Falling During the Last 12 Months
Quality of sleep (PSQI)	1			
Number of chronic diseases	0.352 0.001	1		
Physical activity	-0.166 0.001	-0.259 0.001	1	
Number of falling during the last 12 months	0.137 0.001	0.208 0.001	-0.071 0.053	1

Note. AHAP: Amirkola Health and Aging Project; PSQI: Pittsburgh sleep quality index. Pearson r: Range=-1.00 –+1.00. Correlation is significant at the 0.001 level (2-tailed).

Table 3. Multiple Logistic Regression Analysis for Investigation of Factors Affecting Falling Among Older People in the AHAP, Iran (2016-2017)

Variables	OR	P Value	95% CI	
			Lower	Upper
Quality of sleep (PSQI)	≤5 (R)	1		
	>5	1.33	0.116	0.932 1.89
Use of sleep drugs	No (R)	1		
	Yes	0.916	0.689	0.596 1.41
Marital situation	Single	1		
	Married	0.748	0.160	0.499 1.12
Educational levels	Illiterate (R)	1	0.194	
	Primary	1.008	0.968	0.671 1.51
	Up to diploma and diploma	1.438	0.159	0.868 2.38
	University	0.544	0.141	0.242 1.22
Smoking history	No	1		
	Yes	1.678	0.018	1.091 2.58
Number of chronic diseases	1.114	0.002	1.042 1.19	

Note. AHAP: Amirkola Health and Aging Project; PSQI: Pittsburgh sleep quality index. OR: Odds ratio; R: Reference; CI: Confidence interval.

Table 4. Comparison of Sleep Quality With Falling by Gender Among Older People in the AHAP, Iran (2016-2017)

Variable	Falling		OR	P Value ^a	95% CI	
	Yes No. (%)	No No. (%)			Lower	Upper
Sleep quality (PSQI) in males						
≤5	84 (32.3)	176 (67.7)	1.161	0.302	0.732	1.842
>5	41 (35.7)	74 (64.3)				
Sleep quality (PSQI) in females						
≤5	38 (24.2)	119 (75.8)	2.080	0.001	1.32	3.227
>5	87 (39.9)	131 (60.1)				

Note. AHAP: Amirkola Health and Aging Project; PSQI: Pittsburgh sleep quality index; OR: Odds ratio; CI: Confidence interval.

^aChi-square test.

the risk of falls is lower in married elderly. It seems that marriage and receiving support from the spouse can be effective in preventing falls. It can be mentioned that the stress of lonely death, placement in a nursing home, and the psychological stress of children are reduced with the presence of the spouse. Similarly, Marashi et al reported that living alone in the elderly is one of the risk factors for accidents such as falls (25). In the present research, no significant relationship was observed between fall and marriage, probably due to the homogeneity of the community that underwent investigation.

According to the results of this study, a significant

relationship was detected between sleep quality and falling in women. The risk of falling was 2.080-fold higher in older women with poor sleep quality in comparison to older women with high sleep quality. The findings also represented that sleep quality is related to patients' gender, and men had better sleep quality compared to women, which corroborates with the results of Torabi et al (5) and Iranfar et al (26). One of the reasons for the high rate of falling in women is the decrease in their bone density compared to men. Based on the results of another study, osteoporosis causes more falls in the elderly (13). Additionally, sleep disorders have been reported

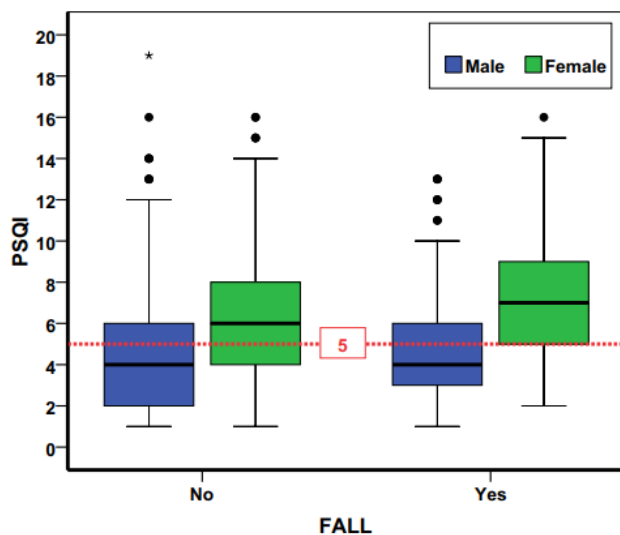


Figure 1. Relationship Between Falling and Sleep Quality by Gender Based on Interquartile Range Among Older People in the AHAP, Iran (2016-2017). Note. AHAP: Amirkola Health and Aging Project.

to be more common in women (5). Several reasons for the higher prevalence of sleep disorders and falls have been stated, including that lower levels of education, less personal income, and more chronic diseases, depression, and anxiety (20), which can probably be found in women more than men.

The results of our study represented that after adjusting for other variables, there was a significant association between falls and the number of chronic diseases in the elderly. The number of chronic diseases was a predictor of falls in the elderly. The presence of chronic diseases in older people reduced the quality of sleep and thereby increased the rate of falling. A similar study reported that the incidence of falls in the elderly with a history of chronic disease was 4.5 times higher than in the elderly who did not have the disease (23). Our finding is also consistent with that of Salarvand et al, indicating a significant association between falling and some chronic illnesses in the older population (27). According to previous research, a history of heart diseases, high blood pressure, orthostatic hypotension, diabetes, seizures, headaches and dizziness, bone and joint diseases, impaired balance, and vision problems can lead to disability and the risk of falls in older people (23,25).

In the present study, there was a significant difference between the two groups in terms of the number of falls over the last 12 months. The results of Salarvand and Birjandi revealed that the risk of falling in the elderly has a significant relationship with a previous history of falls. Among the elderly with a history of falls, most falls occurred several times (21). It seems that the elderly's attitude towards their past plays an important role in their mental health and the occurrence of falls.

The findings of the present study showed that after adjusting for other variables, a significant relationship was found between falling and smoking, which is in agreement with those of Rapuri et al (28), but contradicts that of

Najafi Ghezlcheh et al (13) and Salarvand and Birjandi (21). Likewise, Rapuri et al demonstrated that smoking is a risk factor for weakening muscle strength that can lead to decreased physical function in elderly women. The effect of smoking on physical performance may be partly mediated by its effect on 1, 25(OH) 2D metabolism. In addition, smoking may have a direct effect on physical performance possibly through an effect on vascular function or a direct effect on the muscle (28), which could be the cause of more falls. Based on these results, older people who smoke develop the chronic obstructive pulmonary disease, respiratory distress, and muscle weakness over time (29). Such diseases, especially weakness of the body muscles, increase the possibility of falling. Therefore, the probability of falling is also higher due to the weakness of body muscles.

According to the results of the current study, a significant direct relationship was observed between overall sleep quality scores and the number of chronic illnesses. In other words, the poor quality of sleep was aggravated by the increase in chronic diseases. Studies have also attributed sleep disorders to factors such as coughing, shortness of breath, medical problems, and illnesses in the elderly. Furthermore, sickness and physical pain affect the quality and quantity of sleep (30). More precisely, physical and mental diseases cause sleep disorders in the elderly. Based on the results of Papi et al, multiple diseases, joint stiffness, and knee pain were the significant predictors of sleep disorders in the elderly people and explained changes in sleep quality (31). Sleep disorders cause difficulty maintaining attention, memory and concentration disorders, dementia, and decreased physical performance, and increased mortality in older people (5, 6). These findings are in line with the results of Mirzaei et al (4) and Maghsoudi et al (32). They described that poor sleep quality was significantly associated with chronic diseases. Furthermore, there was a positive and direct correlation between general health and sleep quality. Sleeping is one of the vital needs of humans and its quality is affected by the general health of individuals. Therefore, health education and psychological counseling are essential topics for promoting this group's sleep quality and general health (4,32).

The results demonstrated a significant negative correlation between poor sleep quality and physical activity score; in other words, the sleep quality improved by increasing physical activities. The findings of research concerning the effect of physical activity on anxiety and sleep disorders in the elderly are in conformity with the research evidence claiming that exercise decreases sleep disorders. Physical activity predicts low-quality sleep (poor sleep). On the other hand, anxiety and sleep disorders can be improved through physical activities (33).

Based on the collected data, a positive and significant correlation was observed between poor sleep quality and the number of falls in the last 12 months. More precisely, an increase in the quality of poor sleep increased the number

of falls over the last year. Sleep quality is an important indicator of health in the elderly, and adequate and comfortable sleep is the main foundation of health. Aging reduces the quality of sleep in the elderly, and low sleep quality also increases the deficit in cognitive functions (5,6). Moreover, sleep disorders in the elderly can lead to memory impairments, difficulty concentrating, anxiety, depression, and falling (22). Such limitations increase the possibility of falling, fractures, and injuries (34). It seems that elderly people who have poor sleep quality and sleep problems, including frequent waking at night and shorter sleep, are drowsier during the day, thus they do not have the necessary concentration and are more likely to experience falling. Therefore, one of the specific important concerns in this regard is focusing on the solutions that help the elderly decrease the impacts of poor quality sleep, especially in the case of frequent falls.

The results of this study showed a positive and significant correlation between the number of falls in the last 12 months with chronic diseases. The number of falls in the last 12 months increased with an increase in the number of chronic diseases. The presence of chronic diseases in the elderly reduced their quality of sleep and thus increased the number of falls over the last year. In this regard, our study results are consistent with those of Jafarian Amiri et al (23). Accordingly, a history of diseases such as stroke, chronic respiratory disease, heart failure, impaired consciousness, and depression was associated with falling (27). According to Pahlevanian et al, one of the influential factors in falling can be diseases. There was a significant relationship between chronic diseases, including neurological diseases, painkillers, and home safety in the elderly (7), which can lead to fewer falls. Thus, intervention strategies to improve chronic diseases might be necessary for the effective prevention of recurrent falls among elderly people.

The finding indicated a significant negative correlation between chronic diseases and physical activity. The physical activity of the elderly decreased by an increase in the scores of chronic diseases. The presence of chronic diseases had limited physical activities in older people, and in many cases, they were unable to perform their daily activities. Numerous studies have confirmed the positive effects of physical activities on health. Peel et al described that regular physical activities can affect the health of the elderly and concluded that these activities increase physical and mental functions and prevent physical illness in seniors (35). Another aspect was highlighted by Mortazavi et al, highlighting that physical illness in the elderly causes imbalance and weakness and limits physical performance in these people. Mobility and physical activities are among the most effective ways to prevent disorders in old age. Physical activity can be considered as one of the possible health promotion strategies with positive effects on general health in the life of the elderly. It can improve somatization disorder, anxiety, social dysfunction, and depression in these people (33).

The result represented a tendency toward a significant negative correlation between physical activity and the number of falls in the past year so that an increase in physical activity led to a reduction in the number of falls in the last 12 months of the elderly. Zarei et al believed that combined exercise (strength and stretching) can improve physical functioning and positively affect the balance and decrease the risk of falls in older people. Combined training for 8 weeks had a statistically significant effect on dynamic balance, static balance with eyes closed, static balance with open eyes, and the risk of falls in the elderly in the intervention group compared to the control group (36).

This study is part of the first comprehensive cohort research on the health of older people ever conducted in Iran. The project provides valuable data for planning appropriate health services for older people in this area of Iran. The present study included women and men, and thus researchers are able to make comparisons by gender. One of the weaknesses of the present project is the lack of data in the case of middle age when the aging process begins to occur.

Conclusion

The preliminary results of the present study confirmed the effect of sleep quality on falls, especially in older women. The number of chronic diseases and smoking history had the greatest impact on the falling of the elderly population. Therefore, it is recommended that education, management, and screening of the elderly with poor sleep quality be launched to prevent falls.

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Authors' Contribution

AGH was the first author, main researcher, draft preparator and writer of introduction(30%); HP was correspondence author, main researcher, and writer of discussion(30%);SRH was third author, main researcher, project administrator and study consultant(25%); AB was forth author, main researcher and statistical analyst(15%).

Conflict of Interests

The authors declare that there is no conflict of interests.

Ethical Permissions

The Ethics Committee of Babol University of Medical Sciences approved this study with the ID code IR.MUBABOL.HRI.REC.1398.150.

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References

1. Najafgholipour N, Kalantari N, Ayvaznejad Q. Psychology of the nursing home environment. 1st International Conference on Human, Architecture, Civil Engineering and City(ICOHACC); June 2015; Tabriz, Iran. [Persian].
2. Lutz W, Sanderson W, Scherbov S. The coming acceleration of

- global population ageing. *Nature*. 2008;451(7179):716-9. doi: [10.1038/nature06516](https://doi.org/10.1038/nature06516).
3. Iranian Statistics Center. Selected Results of 2011 Population Census. http://nnt.sci.org.ir/sites/apps/yearbook/year_book_doc/90-99-8.pdf. Accessed October 5, 2014. [Persian].
 4. Mirzaei M, Gholamrezaei E, Bidaki R, Fallahzadeh H, Ravaei J. Quality of sleep and methods of management of sleep disorders in elderly of Yazd city in 2016. *J Shahid Sadoughi Univ Med Sci*. 2017;25(6):467-75. [Persian].
 5. Torabi S, Shahriari L, Zahedi R, Rahmanian S, Rahmanian K. A survey the prevalence of sleep disorders and their management in the elderly in Jahrom city, 2008. *J Jahrom Univ Med Sci*. 2012;10(2):30-6. doi: [10.29252/jmj.10.4.35](https://doi.org/10.29252/jmj.10.4.35). [Persian].
 6. Beyrami M, Alizadeh Goradel J, Ansarhosein S, Ghahraman Moharrampour N. Comparing sleep quality and general health among the elderly living at home and at nursing home. *Iran J Ageing*. 2014;8(4):47-55. [Persian].
 7. Pahlevanian AA, Najarian R, Adabi S, Mirshoja MS. The prevalence of fall and related factors in Iranian elderly: a systematic review. *Arch Rehabil*. 2020;21(3):286-303. doi: [10.32598/rj.21.3.2084.6](https://doi.org/10.32598/rj.21.3.2084.6). [Persian].
 8. Howcroft J, Kofman J, Lemaire ED. Review of fall risk assessment in geriatric populations using inertial sensors. *J Neuroeng Rehabil*. 2013;10(1):91. doi: [10.1186/1743-0003-10-91](https://doi.org/10.1186/1743-0003-10-91).
 9. Ravanipour M. A review on ageing with empowerment approach. *Iran South Med J*. 2011;14(2):140. [Persian].
 10. Golmakani E, Usefi MR, Tabatabaeichehr M, Ghanei Zare F, Moayyed L, Hasanzadeh E, et al. Fall in elderly: a literature review. *J North Khorasan Univ Med Sci*. 2014;5(5):1159-63. doi: [10.29252/jnkums.5.5.S5.1159](https://doi.org/10.29252/jnkums.5.5.S5.1159). [Persian].
 11. Lopes KT, Costa DF, Santos LF, Castro DP, Bastone AC. Prevalence of fear of falling among a population of older adults and its correlation with mobility, dynamic balance, risk and history of falls. *Braz J Phys Ther*. 2009;13(3):223-9. doi: [10.1590/s1413-35552009005000026](https://doi.org/10.1590/s1413-35552009005000026).
 12. Kuptniratsaikul V, Praditsuwan R, Assantachai P, Ploypetch T, Udompunturak S, Pooliam J. Effectiveness of simple balancing training program in elderly patients with history of frequent falls. *Clin Interv Aging*. 2011;6:111-7. doi: [10.2147/cia.s17851](https://doi.org/10.2147/cia.s17851).
 13. Najafi Ghezlcheh T, Ariapour S, Jafari Oori M. Epidemiology and relationship of fall and fear of falling in the elderly residing at Kamrani nursing home, Tehran, Iran. *Iran J Ageing*. 2016;10(4):152-61. [Persian].
 14. Elliott S, Painter J, Hudson S. Living alone and fall risk factors in community-dwelling middle age and older adults. *J Community Health*. 2009;34(4):301-10. doi: [10.1007/s10900-009-9152-x](https://doi.org/10.1007/s10900-009-9152-x).
 15. Hita-Contreras F, Zagalaz-Anula N, Martínez-Amat A, Cruz-Díaz D, Sánchez-Montesinos I, Ibar-Almazán A, et al. Sleep quality and its association with postural stability and fear of falling among Spanish postmenopausal women. *Menopause*. 2018;25(1):62-9. doi: [10.1097/gme.0000000000000941](https://doi.org/10.1097/gme.0000000000000941).
 16. Tripathy NK, Jagnoor J, Patro BK, Dhillon MS, Kumar R. Epidemiology of falls among older adults: a cross sectional study from Chandigarh, India. *Injury*. 2015;46(9):1801-5. doi: [10.1016/j.injury.2015.04.037](https://doi.org/10.1016/j.injury.2015.04.037).
 17. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28(2):193-213. doi: [10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4).
 18. Farrahi J, Nakhaee N, Sheibani V, Garrusi B, Amirkaifi A. Psychometric properties of the Persian version of the Pittsburgh Sleep Quality Index addendum for PTSD (PSQI-A). *Sleep Breath*. 2009;13(3):259-62. doi: [10.1007/s11325-008-0233-3](https://doi.org/10.1007/s11325-008-0233-3).
 19. Taheri Tanjani P, Ainy E, Akbarpuor S, Soori H. Study of characteristics of falls among Iranian elders. *Safety Promot Inj Prev (Tehran)*. 2014;2(4):313-20. [Persian].
 20. Na'emani F, Esmail Zali M, Sohrabi Z, Fayaz-Bakhsh A. Prevalence of risk factors for falls among the elderly receiving care at home. *Iran J Ageing*. 2019;13(5):638-51. doi: [10.32598/SIJA.13.Special-Issue.638](https://doi.org/10.32598/SIJA.13.Special-Issue.638). [Persian].
 21. Salarvand S, Birjandi M. Assessing related factors with falling in older adults. *Iran Journal of Nursing*. 2009;22(61):51-60. [Persian].
 22. WHO Global Report on Falls Prevention in Older Age. <https://extranet.who.int/agefriendlyworld/wp-content/uploads/2014/06/WHO-Global-report-on-falls-prevention-in-older-age.pdf>.
 23. Jafarian Amiri SR, Zabihi A, Aziznejad Roshan P, Hosseini SR, Bijani A. Fall at home and its related factors among the elderly in Babol city Iran. *J Babol Univ Med Sci*. 2013;15(5):95-101. doi: [10.18869/acadpub.jbums.15.5.95](https://doi.org/10.18869/acadpub.jbums.15.5.95). [Persian].
 24. Bastani F, Hajaty S, Hoseini RS. Anxiety and fear of falling in older adults with fall-related orthopedic surgery. *Iran J Ageing*. 2021;15(4):506-23. doi: [10.32598/sija.15.4.2968.1](https://doi.org/10.32598/sija.15.4.2968.1). [Persian].
 25. Marashi T, Ghadiri S, Ramezankhani A, Khodkarim S. Study of fall and some of its related individual factors among the elderly attending to health centers affiliated to health network of Rey city in 2017. *Journal of Health in the Field*. 2018;6(2):49-57. [Persian].
 26. Iranfar M, Ainy E, Soori H. Fall epidemiology in the elderly residents of care centers in Tehran-1390. *Iran J Ageing*. 2013;8(2):30-8. [Persian].
 27. Salarvand S, Birjandi M, Shamshiri MA. Assessing prevalence of fallings and their relation with chronic conditions for older people living in Khoramabad, Iran. *Horizon Med Sci*. 2008;13(4):59-65. [Persian].
 28. Rapuri PB, Gallagher JC, Smith LM. Smoking is a risk factor for decreased physical performance in elderly women. *J Gerontol A Biol Sci Med Sci*. 2007;62(1):93-100. doi: [10.1093/gerona/62.1.93](https://doi.org/10.1093/gerona/62.1.93).
 29. Khan S, Fell P, James P. Smoking-related chronic obstructive pulmonary disease (COPD). *Divers Equal Health Care*. 2014;11(3-4):267-71.
 30. Roepke SK, Ancoli-Israel S. Sleep disorders in the elderly. *Indian J Med Res*. 2010;131:302-10.
 31. Papi S, Karimi Z, Ghaed Amini Harooni G, Nazarpour A, Shahry P. Determining the prevalence of sleep disorder and its predictors among elderly residents of nursing homes of Ahvaz city in 2017. *Iran J Ageing*. 2019;13(5):576-87. doi: [10.32598/SIJA.13.Special-Issue.576](https://doi.org/10.32598/SIJA.13.Special-Issue.576). [Persian].
 32. Maghsoudi A, Dindarloo S, Jamali T, Ghaed S, Rastgoo Z, Hassanipour Azgomi S. Comparison of sleep quality and general health in elderly individuals living in their houses and nursing homes. *Sadra Med J*. 2016;4(3):161-72. [Persian].
 33. Mortazavi SS, Eftekhari Ardebili H, Eshaghi SR, Doral Beni R, Shahsiah M, Botlani S. The effectiveness of regular physical activity on mental health in elderly. *J Isfahan Med Sch*. 2011;29(161):1805-14. [Persian].
 34. Maresova P, Javanmardi E, Barakovic S, Barakovic Husic J, Tomsone S, Krejcar O, et al. Consequences of chronic diseases and other limitations associated with old age-a scoping review. *BMC Public Health*. 2019;19(1):1431. doi: [10.1186/s12889-019-7762-5](https://doi.org/10.1186/s12889-019-7762-5).
 35. Peel SR, Corcoran J, Dayhawl K. The effect of group exercise on physical functioning, mental health and quality of life. *Arch Phys Med Rehabil*. 1999;140(12):179-84.
 36. Zarei H, Norasteh A, Koohboomi M. Effect of combined training (strength and stretching) on balance, risk of falling, and quality of life in the elderly. *Sci J Rehabil Med*. 2018;7(2):201-8. doi: [10.22037/jrm.2017.110651.1433](https://doi.org/10.22037/jrm.2017.110651.1433). [Persian].