

## Relationship between Musculoskeletal Diseases and Risk of Falls in Elderly: A Survey in North-western Iran

### Abstract

**Background :**Falling is a common and serious health-related issue in the elderly .On the other hand, the prevalence of several chronic diseases, including musculoskeletal disorders, increases with age. Therefore, the present study aimed to investigate the relationship between musculoskeletal diseases and falls in the elderly population of Urmia, located in north-western Iran.

**Methods :**The present study was a cross-sectional, descriptive-analytical study including 200 individuals older than 60 who were randomly selected using the cluster sampling method .Data collection was performed using a two-parted questionnaire, including demographics, data regarding musculoskeletal diseases ,and history of falls within the past year. Moreover, data analysis was performed using the SPSS21 , Chi-squared test, and logistic regression.

**Results :**According to our findings %30 , of the participants had experienced falls in the past year. Moreover , there was a significant correlation between musculoskeletal diseases and the variables of age, gender, and marital status. According to the logistic regression results ,falls were 6.2 folds more prevalent in the participants with at least one musculoskeletal disease ,such as osteoarthritis, osteoporosis ,rheumatoid arthritis, or gout ,than those without musculoskeletal diseases) OR=6.2), which is significant ( $P<0.001$ ).

**Conclusion :**We found a relatively high prevalence of falls in the elderly population of Urmia, Iran, while the elderly with musculoskeletal diseases were significantly more likely to have experienced falls within the past year. Therefore, it is recommended to take effective preventive measures considering the fall risk factors in the elderly, such as musculoskeletal diseases.

**Keywords:** Falls, Musculoskeletal Diseases, Aged, Chronic Disease, Health Status

**Received:** 5 months before printing; **Accepted:** 1 month before printing

**Morad Ali Zareipour, PhD\*; Ahmad Sotoudeh, PhD\*\*; Mojtaba Fattahi Ardakani, PhD\*\*\***

### Introduction

\*Health System Research Unit, Health Center of Urmia, Urmia University of Medical Sciences, Urmia, Iran

\*\*Department of Public Health, Bushehr University of Medical Sciences, Bushehr, Iran

\*\*\*Health Factors Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

**Corresponding Author:**  
Morad Ali Zareipour

Email:  
z.morad@yahoo.com

Serious health-related issues in the elderly. This problem is especially of great importance in communities with a high elderly population <sup>(1)</sup>. It has been shown that falls are more prevalent in the elderly, women, and those with the previous history of falls <sup>(2)</sup> . Birth control programs, implementation of disease control programs, and training promotion have led to the increased population of elderly, as well as their life expectancy and quality of life <sup>(2, 3)</sup> . According to literature, 35%-40% of the elderly have experienced at least one fall annually, and about half of them have experienced recurrent falls <sup>(2)</sup> . Accidents are the fifth leading cause of mortality in the elderly, with falls being the most common cause of trauma in this age group <sup>(4)</sup> . Fall-related injuries may be fatal or non-fatal, and risk factors of falls in the elderly are usually classified into internal factors, external factors, and a combination of both, which is true for most cases.

Falls and related injuries may affect the quality of life in the elderly. The fear of recurrent falls in the elderly may lead to consequences, such as limited activities, social isolation, increased dependence, and economic problems. On the other hand, falls have significant impacts on the healthcare and economic systems of society <sup>(5, 6)</sup> .

A fall is defined as a sudden and unintentional positional change causing an individual to land at a lower level, which can be an object, the floor, or the ground. Moreover, a fall must not be a consequence of the sudden onset of paralysis, epileptic seizure, or an overwhelming external force <sup>(7)</sup> .

The prevalence of falls is different in the elderly of different countries, being reported as 28.5%, 26.4%, 33.3%, 31%, 29%, 27.1%, 28.5%, and 27%-30% in Turkey, China, the Netherlands, Switzerland, Australia, Brazil, Argentina, and Iran, respectively<sup>(8-14, 25)</sup>. It is essential to identify the elderly at high risk for falls in order to establish primary preventive measures for falling. Given the high prevalence of falls in the elderly, neglecting the preventive measures might lead to serious consequences, such as fractures, abrasions, and compromised mobility.

Musculoskeletal diseases, such as osteoarthritis, can affect the intracapsular tissue and soft tissue surrounding the joints, including the ligaments, capsules, tendons, and muscles<sup>(15)</sup>. Therefore, these diseases might increase the risk of falls in the elderly. In fact, patients with musculoskeletal diseases also have decreased muscular strength and proprioception<sup>(16)</sup>, which can alter the muscle spindle sensitivity, impair joint protection, and lead to articular instability<sup>(17)</sup>. Thus, these diseases may play a role in falls in the elderly. With this background in mind, the present study aimed to investigate the relationship between musculoskeletal diseases and falls in the elderly population of Urmia, Iran.

## Methods

The present descriptive-analytical study included the individuals aged higher than 60 years who were presented to the healthcare facilities of Urmia, Iran, in 2017. Considering the sample sizes of previous similar studies, the rate of falls in the elderly<sup>(8-10, 13)</sup>, and a confidence interval of 95%, the sample size was calculated as 200 ( $Z=10.96$ ,  $P=0.3$ ,  $d=06$ ). First, 10 out of 35 healthcare facilities were randomly selected using the cluster sampling method and lottery. The elderly were selected from each center using the simple random sampling method. The number of selected individuals was proportional to the elderly population. Data collection was performed using a two-parted questionnaire, including demographics, data regarding

musculoskeletal diseases (osteoarthritis, osteoporosis, rheumatoid arthritis, or gout), history of at least one fall in the past year, and time and location of each fall. The potential participants were invited to visit the healthcare facility via telephone calls. Then, those willing to participate filled the questionnaires. The questionnaires of the illiterate and less educated participants were filled by the researcher through interviews. The inclusion criteria were the age range of 60-80 years, the ability to walk without assistance, and residing in a nursing home. The exclusion criteria included a history of anticonvulsant use and death during the study.

## Ethical Considerations

In this study, we adhered to We followed the ethical principles in all the study stages. The study was approved by the Ethics Committee of the Yazd University of Medical Sciences. Moreover, all the participants were explained about the research objectives and stages before the study and gave written informed consent if willing to participate.

## Results

According to our findings, the mean age of the participants was  $71.42 \pm 5.97$  years, with the age group of 75-80 years being the most common age group (33%). The majority of participants were married (56%), and 42% of them were housewives. Regarding the level of education, the most common was the completion of elementary school (33%), and most of the participants belonged to the middle economic class (54%).

(%30) 60, had a history of falls in the past year, with most falls occurred at home (n=36, 60%) and in the morning (n=26, 43.3%). Furthermore, 114 participants (57%) were diagnosed with at least one musculoskeletal disease, such as osteoarthritis, osteoporosis, rheumatoid arthritis, or gout (Table 1).

Table 1. Distribution frequency and percentage of demographic characteristics of the participants (n=200)		
Variable	N	%
Age	60-65	36 18
	65-70	54 27
	70-75	44 22
	75-80	66 33
Gender	Male	104 52%
	Female	96 48%
Occupational Status	Housewife	84 42%
	Self-employed	40 20%
	Retired	20 10%
	Unemployed	56 28%
Marital Status	Married	112 56%
	Divorced	26 13%
	Diseased spouse	62 31%
Level of Education	Illiterate	58 29%
	Primary school	66 33%
	Junior-high school	42 21%
	Diploma and higher degree	36 17%
Economic Status	Good	56 28%
	Moderate	108 54%
	Poor	36 18%
History of falls	Yes	60 30%
	No	140 70%
Place of falls	House	36 60%
	Outdoors	24 40%
Time of falls	Morning	26 43.3%
	Evening	16 26.7%
	Night	18 30%
Musculoskeletal diseases	Yes	114 57%
	No	86 43%

According to the chi-squared test results ,there was a significant positive correlation between the frequency of falls and the age of the participants ( $P >0.001$ ). In addition, the falls were significantly more prevalent in women compared to men ( $P=0.02$ ) and in those living alone, including divorced, widows, or widowers, compared to the married participants ( $P=0.02$ ). Also, it was shown that those with musculoskeletal diseases, including osteoarthritis ,osteoporosis, rheumatoid arthritis, or gout, experienced the significantly more falls than those without these diseases ( $P>0.001$ ) (Table 2).

All the significant variables were entered into the logistic regression model to investigate their predictive value. According to the results ,3 variables of age, gender, and musculoskeletal diseases could predict the falls in the participants. In fact, the risk of falls was 1.8 times higher in women than men ( $OR=1.8$ ) ,which was significant .Moreover , the risk of falls was 2.2 times higher in the participants older than 75 compared to other age groups ( $OR=2.2$ ) .Finally, the musculoskeletal diseases were found to have the most significant predictive value for falls in the elderly compared to other variables investigated, with the risk of falls being 6.2 times higher in the elderly with at least one musculoskeletal disease, such as osteoarthritis, osteoporosis, rheumatoid arthritis, or gout, compared to those without these diseases ( $OR=6.2$ ). (Table 3)

## Discussion

In aAccording to the present study results, 30% of the elderly experienced at least one fall within the past year, while the previous studies performed in Turkey, China, the Netherlands, Switzerland, Australia, Argentina, and Iran have reported the rate of falls at 28.5%, 26.4%, 33.3%, 29%, 28.5%, and 27%-30%, respectively (4, 8-14 ).(18 ,In addition, most falls occurred at home (60%), which can be explained by the fact that the Iranian elderly often play a passive role in the community, spending most of their time at home .Also, falls were more prevalent in the morning (43.3%), while the least frequency of falls was at the noon times (26.7%). This higher incidence in the morning can be explained by the higher physical activity of the elderly at this time. Compatible with our results, some studies have reported a higher possibility of falls in the elderly during the active hours of the day. (21-19) Therefore, it is recommended to pay more attention to the elderly at these active times of the day .Our study found a significant relationship between the risk of falls and age so that older individuals were more likely to experience falls. This can be explained by the age-related issues experienced by the elderly, such as chronic diseases, visual impairments, and physical weakness ,which has been confirmed by various studies (19, 22, 23).

<b>Table 2. Relationship between demographic characteristics and history of falls (n=200)</b>				
Variable		A positive history of falls	A negative history of falls	P-value
Age	60-65	4 (6.7%)	32 (22.9%)	P< 0.001
	65-70	8 (13.3%)	46 (32.9%)	
	70-75	20 (33.3%)	24 (17.1%)	
	75-80	28 (46.7%)	38 (27.1%)	
Gender	Male	25 (24%)	79 (76%)	P= 0.02
	Female	35 (36.5%)	61 (63.5%)	
Occupational Status	Housewife	30 (35.7%)	54 (64.3%)	P= 0.3
	Self-employed	8 (20%)	32 (80%)	
	Retired	6 (30%)	14 (70%)	
	Unemployed	16 (28.6%)	40 (71.4%)	
Marital Status	Married	26 (23.2%)	86 (76.8%)	P= 0.02
	Divorced	8 (30.7%)	18 (69.3%)	
	Deceased spouse	26 (41.9%)	36 (58.1%)	
Level of education	Illiterate	16 (27.6%)	42 (72.4%)	P= 0.2
	Primary school	25 (37.8%)	41 (62.3%)	
	Junior high school	12 (28.6%)	30 (71.4%)	
	Diploma and higher degree	7 (20%)	29 (80%)	
Economic Status	Good	15 (26.8%)	41 (73.2%)	0.1
	Moderate	31 (28.7%)	77 (71.3%)	
	Poor	14 (38.9%)	22 (61.1%)	
Musculoskeletal diseases	Yes	38 (33.3%)	76 (66.7%)	P< 0.001
	No	22 (25.6%)	64 (74.4%)	

**Table 3. Predictive variables of falls in the elderly using logistics regression test**

Independent variables	$\beta$ (regression coefficient)	S.E	OR (odds ratio)	P-value
Age				
60-65	-	-	1	-
65-70	0.33	0.77	0.66	0.61
70-75	0.55	0.66	1.6	0.08
$\leq 75$	1.2	0.76	2.2	0.04
Gender				
Male	-	-	1	-
Female	0.7	0.74	1.8	0.05
Musculoskeletal diseases				
No	-	-	-	
Yes	1.7	0.55	6.2	0.0001

In the current research, there was a difference between the male and female participants in terms of gender, we found a significantly higher possibility of falls in women compared to men, which was

compatible with the findings by Halil et al.<sup>(8)</sup> in Turkey and Jalali et al.<sup>(13)</sup> in Iran. Moreover, Zhang and Chen<sup>(22)</sup> reported a higher rate of falls in female elderly compared to male elderly. This gender-related difference in our

study can be explained by the fact that old Iranian women are more engaged in daily activities, especially housekeeping and shopping, while the old men are more likely to experience a sedentary lifestyle after retirement. A typical old Iranian man spends his day resting at home, performing religious duties, or meeting with friends.

of falls in married elderly living together compared to divorced individuals, widows, or widowers living alone. In fact, there are more barriers to establishing fall preventive behaviours in single old individuals. However, this can be resolved by proper planning, including lifestyle modification and eliminating obstacles in this respect. In a study by Lim et al.<sup>(24)</sup>, married individuals were more likely to adhere to health-promoting behaviours, which is compatible with our findings.

According to the results of the current study, finally, we found that musculoskeletal diseases were the most important predictive factors for falls in the elderly. In fact, the risk of falls in the elderly with a musculoskeletal disease, such as osteoarthritis, osteoporosis, rheumatoid arthritis, or gout, was 6.2 times higher than in those without these diseases. Other similar studies have also reported a relationship between the risk of falls and chronic diseases in the elderly<sup>(23, 22, 20, 8)</sup>. Chronic diseases can probably lead to disability and weakness in the elderly, leading to subsequent falls. For example, osteoarthritis can affect the joints and surrounding tissues, such as tendons and muscles<sup>(15)</sup>. Moreover, it can lead to proprioceptive impairments and muscular strength loss<sup>(16)</sup>. (A study by Hanley et al.<sup>(25)</sup> found a positive correlation between lower limb muscle weakness and problems such as impaired balance, falls, and related injuries. It is reported that impaired proprioception can alter the muscle reflex responses, reduce the muscular spindle sensitivity, decrease articular protection, and lead to joint instability<sup>(17)</sup>. Therefore, it may play a role in falls in the elderly population.

The present study had some limitations as well. A significant limitation was that we did

not consider other chronic diseases usually found in this age group in our analyses, while these problems may also increase the risk of falls, thereby interfering with our analyses. These chronic diseases can be cardiovascular, neurologic, and ocular diseases. In addition, we did not separate the muscular diseases and diseases related to bones and joints. Therefore, we recommend considering these problems in future studies.

## Conclusion

According to the present study results, the risk of falls was relatively high in the Iranian elderly population. Moreover, the elderly with musculoskeletal diseases were significantly more likely to experience falls. Therefore, it is suggested to take effective preventive measures considering the fall risk factors in the elderly, such as musculoskeletal diseases.

## References

1. Boffin N, Moreels S, Vanthomme K, Van Casteren V. Falls among older general practice patients: a 2-year nationwide surveillance study. *Family practice*. 2014 Jun;1;31(3):281-9.
2. Zhou BY, Shi J, Yu PL. Consequence and risk factors of falls-related injuries in community-dwelling elderly in Beijing. *Zhonghua liu xing bing xue za zhi= Zhonghua liuxingbingxue zazhi*. 2013 Aug 1;34(8):778-81.
3. Mazloomymahmoodabad S, Masoudy G, Fallahzadeh H, Jalili Z. Education based on precede-proceed on quality of life in elderly. *Global journal of health science*. 2014 Nov;6(6):178.
4. Hartholt KA, Stevens JA, Polinder S, van der Cammen TJ, Patka P. Increase in fall-related hospitalizations in the United States, 2001–2008. *Journal of Trauma and Acute Care Surgery*. 2011 Jul 1;71(1):255-8.
5. Stevens JA, Corso PS, Finkelstein EA, Miller TR. The costs of fatal and non-fatal falls among older adults. *Injury prevention*. 2006 Oct 1;12(5):290-5.
6. Bell AJ, Talbot-Stern JK, Hennessy A. Characteristics and outcomes of older patients presenting to the emergency department after a fall: a retrospective analysis. *Medical Journal of Australia*. 2000 Aug;173(4):179-82.

7. Huang HC, Gau ML, Lin WC, George K. Assessing risk of falling in older adults. *Public Health Nursing*. 2003 Sep;20(5):399-411.
8. Halil M, Ulger Z, Cankurtaran M, Shorbagi A, Yavuz BB, Dede D, Ozkayar N, Ariogul S. Falls and the elderly: Is there any difference in the developing world?: A cross-sectional study from Turkey. *Archives of gerontology and geriatrics*. 2006 Nov 1;43(3):351-9.
9. Chu LW, Chiu AY, Chi I. Falls and subsequent health service utilization in community-dwelling Chinese older adults. *Archives of gerontology and geriatrics*. 2008 Mar 1;46(2):125-35.
10. Stalenhoef PA, Diederiks JP, Knottnerus JA, Kester AD, Crebolder HF. A risk model for the prediction of recurrent falls in community-dwelling elderly: a prospective cohort study. *Journal of clinical epidemiology*. 2002 Nov 1;55(11):1088-94.
11. Swanenburg J, de Bruin ED, Uebelhart D, Mulder T. Falls prediction in elderly people: a 1-year prospective study. *Gait & posture*. 2010 Mar 1;31(3):317-21.
12. Morris M, Osborne D, Hill K, Kendig H, Lundgren-Lindquist B, Browning C, Reid J. Predisposing factors for occasional and multiple falls in older Australians who live at home. *Australian journal of physiotherapy*. 2004 Jan 1;50(3):153-9.
13. Jalali MM, Gerami H, Heidarzadeh A, Soleimani R. Balance performance in older adults and its relationship with falling. *Aging clinical and experimental research*. 2015 Jun;27(3):287-96.
14. Mahmoodabad SS, Zareipour M, Askarishahi M, Beigomi A. Prevalence of Falling and its relation with Chronic diseases and Balance of Older Adults in Urmia City. *Int J Ayurvedic Med*. 2018 Oct 1;9(4):273-8.
15. Hassan BS, Mockett S, Doherty M. Static postural sway, proprioception, and maximal voluntary quadriceps contraction in patients with knee osteoarthritis and normal control subjects. *Annals of the rheumatic diseases*. 2001 Jun 1;60(6):612-8.
16. Hall MC, Mockett SP, Doherty M. Relative impact of radiographic osteoarthritis and pain on quadriceps strength, proprioception, static postural sway and lower limb function. *Annals of the rheumatic diseases*. 2006 Jul 1;65(7):865-70.
17. Hadian MR, Olyaei GR, Jaleai S, Mazaheri H. Assessment of balance impairments in patients with knee osteoarthritis. *Journal of Modern Rehabilitation*. 2010;4(3):18-22.
18. Reyes-Ortiz CA, Al Snih S, Markides KS. Falls among elderly persons in Latin America and the Caribbean and among elderly Mexican-Americans. *Revista panamericana de salud pública*. 2005;17:362-9.
19. Lehtola S, Koistinen P, Luukinen H. Falls and injurious falls late in home-dwelling life. *Archives of gerontology and geriatrics*. 2006 Mar 1;42(2):217-24.
20. Corsinovi L, Bo M, Aimino NR, Marinello R, Gariglio F, Marchetto C, Gastaldi L, Fissore L, Zanocchi M, Molaschi M. Predictors of falls and hospitalization outcomes in elderly patients admitted to an acute geriatric unit. *Archives of gerontology and geriatrics*. 2009 Jul 1;49(1):142-5.
21. Bergland A, Jarnlo GB, Laake K. Predictors of falls in the elderly by location. *Aging clinical and experimental research*. 2003 Feb;15(1):43-50.
22. Zhang Y, Chen W. Research overview and progress of the elderly falls. *Chin J Gerontol*. 2008;9:929-31.
23. Coimbra AM, Ricci NA, Coimbra IB, Costallat LT. Falls in the elderly of the Family Health Program. *Archives of gerontology and geriatrics*. 2010 Nov 1;51(3):317-22.
24. Lim YM, Sung MH, Joo KS. Factors affecting health-promoting behaviors of community-dwelling Korean older women. *Journal of gerontological nursing*. 2010 Oct 1;36(10):42-50.
25. Hanley A, Silke C, Murphy J. Community-based health efforts for the prevention of falls in the elderly. *Clinical interventions in aging*. 2011;6:19.