Original Article

Fall-Risk Assessment in the Elderly Using the Persian Version of Fall-Risk Screening Tool: A Population-Based Study

Abstract

Background: Falling is a serious challenge for public health and a leading cause of morbidity and mortality among the elderly. This study conducted to evaluate the psychometric properties of the Persian version of fall risk screening tool (P-FRST). **Methods:** A cross-sectional study carried out from September 2018 to March 2019 on 537 elders who referred to urban health centers in Kerman, Iran. Demographic data recorded and fall-risk assessment was performed using P-FRST and the timed up and go test (TUG). The maximum possible score is 33 for P-FRST and score ≥18 is considered as high risk. The time ≥12 s in TUG test considered as a risk for falling. Data analyzed by SPSS using *t*-test, analysis of variance, and linear regression. **Results:** The mean age of participants was 67.18 ± 6.93. According to P-FRST, 22% of the elderly were high risk and 62% had a moderate risk for falling. The mean score for falling risk was significantly higher in the females, illiterates, income <10 million IRRLs, and the unemployed. **Conclusions:** Due to the risk of falling in the elderly, it is suggested that in the comprehensive health care for the elderly, to assess the risk of falling, especially in high-risk groups, so that preventive interventions can be made.

Keywords: *Accidental falls, aged, Iran, risk assessment, risk factors*

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Introduction

Falling is a serious challenge for public health and a leading cause of institutionalization, morbidity, and mortality among the elderly.[1,2] According to World Health Organization (WHO), 28%–35% of people aged ≥65 fall each year and the risk increases with age.[3] Among people over the age of 70, especially the females, the risk of fall-related mortality is higher than the younger adults.[4]

The majority of fall cases arise from the interaction of multiple risk factors. However, about 10% of falls occurred in adults aged ≥75 with no risk factors.[5] It is recommended especially by US Preventive Services Task Force and The American Geriatrics Society and British Geriatrics Society that fall risk screening be done in the elderly by the healthcare provider so that preventive interventions can be made.[5-8]

Several instruments have been developed to assess the falling risk among the elderly such as timed up and go test (TUG),[7] stopping elderly accidents, deaths, and injuries (STEADI),[9] falls-risk assessment scale for the elderly, Morse falls scale (MFS), and falls risk assessment tool (FRAT).[10]

Fall-risk screening tool was developed by the Albert Lea Medical Center in the United States. This tool evaluates both the internal and external risk factors for fall including personal, behavioral and environmental factors. The instrument has good psychometric properties and provides a standardized assessment to determine fall risk factors. Because it is done through an interview, also facilitates the interaction between healthcare provider and the elderly.[11]

According to our literature review, the instrument has not been evaluated in the Iranian population. Therefore, the current study aimed to evaluate the validity and reliability of Persian version of fall risk screening tool (P-FRST) and determine the frequency and related factors of fall among the elderly who referred to urban health centers in Kerman, southeast of Iran.

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Methods

A cross-sectional study conducted on 537 elderly who referred to urban health centers affiliated to Kerman University of medical sciences (Kerman, Iran) between October 2018 and February 2019.

The participants selected through multistage sampling methods. In a way that the urban health centers selected randomly and in each center, the participants entered the study by convenience method. Inclusion criteria were age ≥60 years and informed consent to participate in the study. Seniors with a cognitive problem, history of trauma, fracture, orthopedic problem, and residing in nursing homes excluded. After a full explanation about the research objectives and process, written consent was obtained.

Demographic data including age, gender, household income level, marital, education, and employment status recorded. The fall-risk assessment was performed using the P-FRST and the TUG test.

Fall-risk screening tool contains 23 items that are categorized into three subitems.

Personal factors (six items) including age, history of fall in the past 6 months, general weakness, medication, alcohol consumption, and living alone. Environmental factors (10 items) including: the condition of shoes/footwear (untied, shoes falling apart, smooth sole), adequate lighting in the living environment (rooms, bathroom, corridors, and outside), the status of the stairs (no railing on the stairs, steep/unsafe/broken stair/railing), the floors (scatter rugs, slippery/uneven floors), the furniture (unstable/broken/low to the ground), cluttered walkways, medical equipment (poorly maintained/improperly used), bathroom (improper bathroom accessibility/safety devices), the presence of pets/no phone or poor access to the phone.

Individual health status (seven items) containing: urinary/fecal incontinence, poor vision with or without glasses, the presence of confusion, dementia, depression, anxiety, dizziness, and fear of falling. The presence of lower extremities problems (pain, edema, numbness, stiffness, decreased range of motion. predisposing diseases (multiple sclerosis, Parkinson's disease, seizure, low blood pressure, osteoporosis, arthritis, fracture, limb and stroke, cancer, fracture, COPD, diabetes, loss of limb and others).

If there were any risk factors, one point is assigned to the considered item, except for the age and underlying disorders. Zero, one, and two points are considered for the age under 70, 70–79, and ≥80 years, respectively. Zero, two, and three points are assigned to the absence of underlying illnesses, maximum of two, and three or more ones, respectively. Therefore, the maximum possible score is 13, 10, 10 and 33 for risk factors, physical environment, and health status, and in total, respectively. The score of zero to six is considered as low risk, 7–17 as medium risk and ≥18 is considered as a high risk for falling. The validity of the original version was confirmed and its reliability was reported with Cronbach's alpha of 0.8 and ICC = 0.8.[11]

To provide P-FRST, after obtaining the permission, forward and backward method used to translate the tool into Persian and then adapted culturally. A panel of experts, including two internal medicines, three community medicines, and a public health specialist confirmed the face and content validity of the instrument. The content validity index (CVI) of the tool determined as 0.87.

In a pilot study which consisted of 50 participants, the internal consistency of the subscales (using Cronbach's alfa coefficient) was determined as 0.73.

TUG test was developed by Podsiadlo and colleagues in 1991. The test recommended by the American and British Society for the prevention of falls and also affirmed by some studies as a valid instrument for fall-risk screening.[7,12]

TUG test consists of sitting in a standard chair, standing up, walking 3 m, and then turning around, walking back, and sitting down.[7] To support the elderly and maintain his/her safety, at all stages of the TUG test, the interviewer should stand close to his/her. A participant who takes ≥12 s to complete the TUG is at risk for falling.[13]

The study approved by the Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1397.062). The interviews and TUG test were conducted voluntarily and anonymously and it took 20 min to complete each interview. The participants were assured that the data would be used only for study purposes.

Data analyzed by SPSS version 20 (SPSS Inc., Chicago, IL, USA) using *t*-test, analysis of variance, *Post hoc* test, Pearson, and multiple linear regressions.

Results

Of 537 participants, 307 (57.1%) were female, 380 (70.8%) married, with monthly household income 10–20 million IRRLs (45.4%) and the mean age of 67.18 ± 6.93 years [Table 1].

The mean score of FRST was 12.47 ± 5.69, accordingly, 22% and 61.3% of the elderly had a high and moderate risk for falling, respectively. The mean score of the TUG test was 18.80 ± 15.1, accordingly, 67% of the elderly were at risk for falling.

Table 2 shows the comparison of the fall risk scores according to the participants' demographic data. The fall-risk score was significantly higher in the females, widows, illiterates, unemployed, and elders with income <10 million IRRLs according to P-FRST (P = 0.001). Almost similar differences were seen in the TUG test, but none of them was statistically significant (P > 0.05).

There was a direct and statistically significant correlation between the two scores. (r = 0.36, P = 0.001) Also, there was a direct and statistically significant week correlation between the participants' age, P-FRST, and TUG scores. (r = 0.12, r = 0.13, P = 0.001).

In multiple linear regressions, marital and education status, household monthly income, and TUG score significantly predicted the fall-risk score. Accordingly, with every increase of one unit in the TUG score, the fall-risk score (on the average) increases by 0.12 units. The widows had on the average 1.5 points higher score compared with the married. The participants with household monthly income ≥20 million IRRLs and 10–20 million IRRLs had on the average 2.54 and 2.52 point lower score compared with those with income <10 million IRRLs. The elderly with a degree of diploma and under diploma had on the average 2.32 and 2.20 point lower score compared to the illiterates. The results of the regression indicated that these predictors explained 29.00% of the variance (R^2 = 0.29, F = 17.55, P = 0.001) [Table 3].

Table 1: Demographic and disease-related characteristics of the participants

		n (%)
Gender	Male	230 (42.9)
	Female	307 (57.1)
Level of education	Illiterate	269 (50.1)
	Under high school diploma	198 (36.9)
	High school diploma	55 (19.2)
	Academic	15 (2.8)
Employment status	Employed	33 (6.1)
	Self-employed	49 (9.1)
	Unemployed	55 (10.2)
	Housekeeper	256 (47.8)
	Retired	126 (23.5)
	Others	18 (3.3)
Marital status	Married	380 (70.8)
	Divorced	11 (2.0)
	Widow/widower	146 (27.2)
Household monthly income (IRRls)	<10 million	244 (45.4)
	10-20 million	167 (31.1)
	≥20 million	40 (7.5)
	Not stated	86 (16)

Discussion

Our study revealed that P-FRST had acceptable validity and reliability. Therefore, it can be used by our healthcare providers in the primary health care setting for fall-risk assessment among the elderly. The original version of the instrument also revealed acceptable psychometric properties. Fielding and colleague suggested that it could be used as a useful and reliable tool to determine falling risk factors among older adults in an ambulatory outpatient clinical setting.[11]

Several instruments have been developed to assess the fall risk in the elderly,[7,9,10] but the key feature of FRST is that during an interview which facilitate the elderly-providers interaction, personal, environmental, and health-related factors are assessed together.[11]

Our study found the majority of the studied elderly had moderate and about one-fifth of them were high risk for falling according to P-FRST. Fielding and colleague reported that approximately 14%–17% of the studied elderly ambulatory population categorized as high risk and 76%–83% percent as moderate risk according to FRST,[11] which is somewhat consistent with our study. Females had a higher risk than males. Similar studies show that falling

Table 2: The comparison of fall-risk scores according to demographic characteristics

		TUG	*P*	FRST	*P*
Gender	Male	17.59 (14.1)	0.09	11.28 (5.7)	0.001
	Female	19.80 (15.8)		13.40 (5.5)	
Level of education	Illiterate	19.54 (11.2)	0.16	14.42 (5.8)	0.001
	Under high school diploma	16.87 (12.5)		10.67 (5.0)	
	High school diploma	20.74 (18.5)		10.16 (3.8)	
	Academic	10.66 (14.7)		10.66 (5.7)	
Employment status	Unemployed	20.67 (13.01)	0.81	13.81 (6.3)	0.001
	Employed	18.00 (8.7)		12.63 (6.4)	
	Self-employed	19.04 (16.3)		10.51 (6.4)	
	Retired	17.31 (14.4)		10.69 (4.1)	
	Housekeeper	18.68 (13.5)		13.49 (5.6)	
Marital status	Married	17.96 (14.5)	0.24	11.61 (5.6)	0.001
	Divorced	18.63 (11.6)		13.10 (6.4)	
	Widow/widower	20.34 (14.5)		14.63 (5.1)	
Household monthly income (IRRls)	<10 million	19.79 (12.6)	0.42	14.20 (6.1)	0.001
	10-20 million	17.88 (15.5)		10.38 (4.6)	
	≥20 million	20.12 (18.5)		10.45 (4.2)	

Values are displayed as mean (SD)

Table 3: The prediction of fall-risk score (according to FRST) in multiple linear regressions

	Unstandardized Coefficients		Sig.	95.0% Confidence Interval for B	
	B	Standard Error		Lower Bound	Upper Bound
Constant	9.65	2.68	0.001	4.38	14.93
Age	0.024	0.03	0.50	−0.04	0.094
Sex	0.427	0.52	0.41	−0.60	1.46
TUG	0.122	0.01	0.001	0.09	0.152
Divorced	1.19	1.51	0.43	−1.78	4.17
Widow	1.49	0.58	0.01	0.352	2.64
Income1-2 million IRRls	−2.52	0.55	0.001	−3.60	−1.43
Income ≥2 million IRRls	−2.53	0.98	0.01	−4.46	−0.61
Under diploma	−2.19	0.58	0.001	−3.33	−1.04
Diploma	−2.32	0.88	0.01	−4.05	−0.59
Academic	−1.24	1.48	0.40	−4.16	1.66

incidence and the risk of fall are higher among females compared with males.[8,14]

Also, we found that as the elderly age increases, the risk of fall also increases which is compatible with previous studies.[6,7,9,15] As age increases, the risk of age-related comorbidities increases as well. The presence of the underlying disease is one of the most important risk factors for falling. Also among the elderly, the probability of polypharmacy is higher, which is also increases the risk of sleep disturbance, sedation, orthostatic hypotension, and dizziness.[15-17]

However, age may be considered as an independent risk factor for fall because about 10% of falls occurred in adults aged ≥75 years with no risk factors.[5]

According to our results, widows and illiterates had a higher risk of falling. To *et al*. revealed that women who lived alone are at higher risk for falling.[18] Woo-Chul Park found among adults aged ≥65 years, those who are highly educated and living with family members had a lower risk for falling according to fall-risk assessment.[19]

In this study, there was a direct correlation between P-FRST and the TUG test. TUG test has been widely used and presents high reliability, but several studies revealed that it should be used with caution for predicting falls in old people and should associate with other indicators.

Our study was cross sectional and our participants were selected through a nonprobability convenience sampling method, the finding must be generalized with caution. But on the other hand, for the first time, P-FRST have been employed in an Iranian population and revealed good validity and reliability. Therefore, it can be used by our primary health providers during the integrated management of the elderly.

Given that home hazards are one of the most important risk factors for falls,[20] investigating and reducing these factors will play an important role in preventing falls in the elderly. P-FRST with its good psychometrics properties can be helpful in identifying these factors.

Conclusions

The majority of the elderly in this study were at risk for falling, so it is imperative our health care providers to screen all elderly using a simple, valid, and feasible tool such as P-FRST.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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