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Prevalence of and risk factors for falls and disability among elderly individuals in a Turkish population (Trabzon Province)

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ABSTRACT

Falls are a significant problem in the elderly. The aim of the study was to investigate the prevalence of falls and the risk factors for falls and disability in an elderly population. In this study with a descriptive and correlational design, the sample population included 343 elderly individuals who were 65 years and above. Data gathered with a questionnaire consist of 14 questions related to fall prevalence, fall risk's factors and brief disability scale. Data was evaluated by chi-square, Student T test, correlation, multiple and logistic regression analyse. In study, the prevalence of falls was found 36.2% in elderly in a year. Tissue injuries (17.2%) is the most common health problems caused by the falls. As well as the traditional risk factors for falls; widowed/never married and underweight, extended family structure was determined to be of the risk factors for falls. 54.8% elderly had a severe disability, and the prevalence of falls were higher among those with mild disability (50.0%). It was identified that almost one third of the elderly people living in Trabzon fell down and had health problems (28%) correlated with falls. It was determined that half of the elderly severe disability.

Key words: Fall prevalence, risk factors, community-dwelling, elderly, disability

INTRODUCTION

Falls are a common problem and they can cause severe morbidity and threaten functional independence among the elderly. Because of the ageing of societies worldwide, falls are not only a problem in developed countries but are also becoming prevalent in developing countries. Indeed, according to several studies, 20%–44% elderly (aged ≥65 years) fall each year[1-4] . Although fall-related data in Turkey are relatively limited, Halil et al,[5]reported a falls rate of 28.5%. For community-dwelling older people, falls occur mostly within their homes with most of these falls occurring in commonly used rooms.

As a result of individual and environmental risk factors, tissue injury, fractures and increased traumatic complications (such as fear of fall, functional impairment and social isolation) may occur in many individuals[2]. Furthermore, old age, chronic diseases, visual deficit, urinary incontinence and disability are high-risk factors for falls[6]. Falls, which are a burden for both families and societies, are an important community healthcare issue because of the health issues, long-term care and associated high health costs. Therefore, for preventing falls, it is important to assess individual risk factors and home hazards. A recent meta-analysis suggested that 21% falls can be prevented with arrangements made in the social sphere and home environments [7].

Many risk factors regarding falls have been reported in previous studies[1-6]. Fall rates may differ according to varying sociodemographic factors, cultural differences, living conditions and physical/cognitive functions. For example the elderly in Turkey generally have a lower level of educational attainment than younger age groups, and

they mostly want to live with their children or in their own houses[8]. In addition, in the Black Sea Region of Turkey, where this study was undertaken, people are relatively more active (both inside and outside the house).

Within Turkey's national health care system, home care services oriented to older peoples are extremely limited and insufficient. Thus within the scope of health services, falls and outcomes relating to falls in community-dwelling older adults are not reported. There is still relatively little information available on the health of community-dwelling older adults in Turkey because most studies are limited to only nursing homes and clinics[9, 10].

Therefore, this study was conducted to identify the prevalence of and risk factors for falls as well as the resulting health issues and disabilities among house-dwelling individuals. Knowledge of the fall frequency, risk factors and disabilities in older people in different cultures will contribute to proper comparison and standardization of results to assist nurses working in home care services. Moreover, a better understanding of falls and their potential consequences may inform both health professionals and health service planners.

Purpose

The study used a descriptive and correlational design to determine the risk factors of falls, fall-associated disability and the prevalence of falls in the elderly aged ≥65 years living in a home environment.

We sought answers to the following questions:

a- What is the prevalence of falls in the elderly?
b- What is the percentage of elderly with disability?
c- What are the risk factors for falls?
d- What are the causes of falls?
e- What are the developing health problems because of falls?

MATERIALS AND METHODS

Sample size

The total population of interest consisted of 15,196 elderly individuals who lived in the central area of Trabzon City in Turkey. These individuals were aged ≥65 years according to 2011 demographic data. In this descriptive and correlational design study, a stratified random sampling method was used. Fourteen locations comprising the central area of Trabzon City were surveyed using proportional sampling that considered population size, age and gender. The results were considered to be representative of all the locations. Bedridden elderly individuals (with conditions such as plegia plus those with poor cognitive function or who could not be contacted were excluded from the sample. This study only 65 years of age and above who live in Trabzon's city center can generalize to individuals. The sampling method was applied according to a formula (Known number of individuals in the population) devised by Sümbüloğlu et al[11] .

According to Rubenstein[12] fall prevalence was determined 35% of 65 years or over individuals. A final sample of 343 individuals was based on fall rate of 35%, .05 deviation and 95% confidence intervals.

Data collection

The data collection tools included a 'Description Form' and the 'Brief Disability Questionnaire-BDQ'. In the first section, the Description Form was designed after a literature review and consisted of 3 parts and 14 questions[1, 13]. The Description Form included questions about the participants' sociodemographic characteristics (i.e. age, gender, marital status, educational status and family type); health status (body mass index [BMI], chronic disease, polypharmacy); functional limitation (urinary incontinence, vision deficit and gait/balance deficit); home hazards (the lack of grab bars in closet and bathroom, rugs/carpets, slippery surfaces, improper slippers, electric cords); and about falls (history of falls in the last year, the number of falls, health problems caused by a fall). The second data collection tool was BDQ, which is a short questionnaire designed by the World Health Organization (WHO) and measures physical and social disability among individuals. Turkish validity and reliability tests of BDQ were performed by Kaplan[14].

BDQ consists of 11 questions that assess individuals' circumstances during the previous month. The first questions addresses whether individuals are impaired by health problems while performing activities of daily living, such as playing sports, moving tables, carrying bags, climbing stairs/ramps, lifting heavy objects, walking long distances, washing and using toilets. Other questions address the effect of health problems on hobbies, daily activities, desire to work, productivity and interpersonal relations. These factors are scored with three points—0 = never, 1 = sometimes or never and 2 = always or severe—and the total score is calculated. The total score ranges between 0 and 22. A score between 0 and 4 indicates no disability, a score between 5 and 7 indicates mild disability, a score

between 8 and 12 indicates moderate disability and a score of 13 or more indicates severe disability. In the current study, the Cronbach α value for BDQ was 0.72.

The study was conducted between June and August 2012. Research data were collected by face-to-face interviews with the participants during home visits. Each interview lasted approximately 20–30 min. The Description Form and BDQ were administered by four interviewers who were trained by the lead author. The selection process to find suitable participants first occurred at schools or mosques in each area and used an address list. Those individuals aged ≥65 years who met the inclusion criteria were included in the study. Individuals were chosen by skipping two consecutive names from the address list, and the third person was selected for possible inclusion. If that third individual did not live at that address, another two consecutive elderly individuals were skipped on the address list and the next individual was selected.

Analysis

Data were assessed with the SPSS (Statistical Package for Social Sciences) v13.0 software program. In the data analysis, frequencies, means, chi-square, student's *t*-tests, correlations and multiple and logistic regression analyses were employed. A *p* value of <0.05 was considered statistically significant, with a *95*% confidence interval.

Ethical considerations

Ethics committee approval to undertake this study was granted by the Region Ethics Committee, and official permission from the Trabzon local government was obtained. Prior to this study, the participants were informed of the purpose of the research, and informed consent was obtained from each participant.

RESULTS

In the studied population, the mean age was 68.3 ± 3.2 years (range: 68–84 years). 53.4% were female; 75.8% were married; 75.2% were part of a nuclear family structure; 40.5% were of normal weight; and 63.8% had finished primary/elementary school. The prevalence of falls during the previous year among the elderly in their homes was 36.2% (n = 124). During the previous year, 25.9% and 10% elderly fell once and at least twice, respectively; 28% of those who fell developed fall-related health problems. Health problems caused by the falls included tissue injuries (17.2%), fracture (5.8%) and fear of falling [again] (5.5%), respectively.

Among elderly aged ≥70 years with a history of falls (48.6%, $p = 0.001$), low educational status (42.0%, $p = 0.002$), extended family structure (54.3%, $p = 0.001$), underweight (62.5%, $p = 0.039$), presence of chronic diseases (40.1%, $p = 0.001$), polypharmacy (50.0%, $p = 0.046$), poor visual deficit (48.7%, $p = 0.001$), gait/balance deficit (62.3%, $p = 0.001$) and urinary incontinence (60.9%, $p = 0.011$) were found to be significant risk factors for falls ($p < 0.05$). In addition, female gender (38.8%, $p = 0.275$) and widowed/never married (41.6%, $p = 0.294$) had a higher rate of falls, although these were not statistically significant ($p > 0.05$). When compared in terms of elderly individuals fall and fall risk factors in the home did not differ significantly between in the two groups ($p > 0.05$) (Table 1).

According to the forward logistic regression analysis, results for the history of fall compared to some individual variables showed that polypharmacy, urinary incontinence and gait/balance deficit was significant variables in this model as fall risk factors ($p < 0.05$). The risk of fall because of polypharmacy was 13.52-fold, urinary incontinence 5.30-fold and gait/balance deficit 18.50-fold (Table 2).

Table 1:Characteristics of the Sample According to Independent Variables (N=343)

Variables		Fallers n (%)	Nonfallers n (%)	*p** values
Socio-demographic Variables				
Age	65-69 years	71 (30.3)	163 (69.7)	.001
	≥70 years	53 (48.6)	56 (51.4)	
Gender	Female	71 (38.8)	112 (61.2)	.275
	Male	53 (33.1)	107 (66.9)	
Marital Status	Married	89 (34.2)	171 (65.8)	.294
	Widowed/never married	35 (41.6)	48 (58.4)	
Educational Level	Primary school degree and below	92 (42.0)	127 (58.0)	.002
	Secondary school and above	32 (25.8)	92 (74.2)	
Family Type	Extended family	25 (54.3)	21 (45.7)	.001
	Nuclear family	82 (31.8)	176 (68.2)	
	Living alone or with caregiver	17 (43.6)	22 (56.4)	
Health Status				
	Underweight	15 (62.5)	9 (37.5)	.039
	Normal weight	47 (33.8)	92 (66.2)	
	Overweight	43 (36.4)	75 (63.6)	
Body Mass Index (BMI)**	Obese	19 (30.6)	43 (66.9)	
Chronic Disease	+	115 (40.1)	172 (59.9)	.001
	-	9 (16.1)	47 (83.9)	
	+	21 (50.0)	21 (50.0)	.046
Polypharmacy***	-	103 (34.2)	198 (65.8)	
Functional Limitation Related Variables				
	Poor	76 (48.7)	80 (51.3)	.001
Visual Deficit	Good	48 (25.7)	139 (74.3)	
	+	14 (60.9)	9 (39.1)	.011
Urinary Incontinence	-	110 (34.4)	210 (65.6)	
	+	76 (62.3)	46 (37.7)	.001
Gait/Balance Deficit	-	48 (21.7)	173 (78.3)	
Home Hazards				
Slippery Surfaces	+	69 (34.5)	131 (65.5)	.451
	-	55 (38.5)	88 (61.5)	
Rugs/Carpets	+	50 (40.3)	74 (59.7)	.226
	-	74 (33.8)	145 (66.2)	
The Lack Of Grab Bars and Closet In The Bathroom	+	22 (50.0)	22 (50.0)	.410
	-	102 (34.1)	197 (65.9)	
Electric Cord	+	19 (27.6)	42 (72.4)	.136
	-	108 (37.9)	177 (62.1)	
Improper Slippers	+	15 (48.4)	16 (51.6)	.137
	-	109 (34.9)	203 (65.1)	

**p: p- value from Chi-square*
***BMI<18.5:Underweight, BMI≥18.5-<24.9:Normal weight, BMI≥25.0-<29.9:Overweight, BMI≥30.0:Obese*
****Polypharmacy: More than 3 drugs*

Table 2: Individual Variables of Fall History, Obtained by Logistic Regression Analysis

Variables	*B*	SE	Wald	%95 C.I for EXP(B)	*p*-value
Age	-.093	.081	1.306	.777-1.069	.253
Gender	1.474	.886	2.767	.769-24.795	.096
BMI	-.386	.637	.367	.195-2.368	.544
Polypharmacy	-2.536	.690	13.525	.020-.306	.000
Urinary Incontinence	-2.036	.884	5.301	.023-.739	.021
Visual Deficit	.746	.473	2.483	.834-5.328	.115
Gait/Balance Deficit	-2.036	.474	18.508	.051-.329	.000

B: regression coefficient, SE: standard error, CI: confidence interval

As shown in Table 3, when examining the causes of falls among the elderly, accident/home hazards (31.2%) was the leading cause, followed by gait/balance deficit (27.2%), postural hypotension (19.2%), dizziness (6.4%), visual deficit (5.6%) and syncope and mobility limitation/osteoarthritis (1.6%).

Table 3: Causes of Falls in the Elderly

Cause	n (%)
Accident/Home Hazards	39 (31.2)
Gait/Balance Deficit	34 (27.2)
Postural Hypotension	24 (19.2)
Dizziness	8 (6.4)
Visual Deficit	7 (5.6)
Syncope	2 (1.6)
Mobility Limitation/Osteoarthritis	2 (1.6)

According to BDQ scores, 54.8% elderly had severe disability, whereas 39.1% had moderate disability and 5.8% had mild disability. As shown in Table 4, by applying multiple linear regression analyses to measure the influence that level of disability had on falls, we identified the following.

Table 4: Individual Variables of Disability, Obtained by Regression Analysis

Variables	B	SE	*B*	t	*p*-value
Gender	-.633	.334	-.088	-1.894	.059
BMI	-.385	.197	-.092	-1.958	.051
Chronic Disease	1.859	.457	.191	4.071	.000
Polypharmacy	1.102	.513	.100	2.150	.032
Urinary Incontinence	1.319	.690	.092	1.913	.057
Visual Deficit	-1.402	.362	-.194	-3.870	.000
Gait/Balance Deficit	2.234	.397	.297	5.621	.000
Recurrent Falls	-.299	.253	-.059	-1.180	.239
R^2	.21				

F=18.934

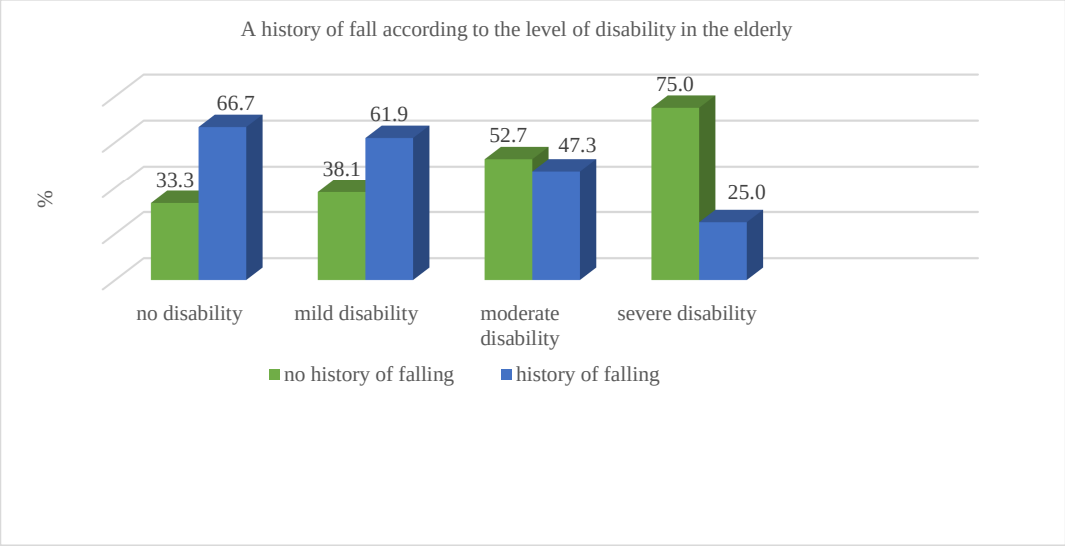

Figure 1:A History of Fall According to the Level of Disability in the Elderly

Disability was explained rate of 21% by individual variables (i.e. chronic disease, polypharmacy, visual deficit and gait/balance deficit) ($p < 0.05$, $R^2 = 0.21$, $F = 18.934$). However, urinary incontinence, gender, BMI and recurrent falls were not statistically significant for this model ($p > 0.05$). There was a significant difference between fall and disability ($p = 0.000$, $t = 5.047$) in those with mild disability; the rate of fall is highest (61.9%) in the elderly who with severe disability (25.0%) (Figure 1).

DISCUSSION

In many countries, epidemiological studies show that the prevalence of falls at very high rates. In this study, fall prevalence in this study was 36.2% during the previous year. The fall prevalence results of this study during the previous are similar to those of Stalenhoef et al,[2] 33% and Bongue et al,[1] 32%. Letts et al,[3] performed a systematic meta-analysis and found a fall rate of 30% per annum; they suggested that 50% of those who fall will fall again. In contrast to those studies, Hawk et al,[4] (44%) found higher fall rates during the previous year. In our study,

25.9% elderly fall once and 10% of elderly fall twice (or more) in the previous year. According to a literature review, recurrent fall rates were different in studies by Stalenhoef et al,[2] and Bongue et al,[1].

According to the results of several studies, it is well known that home hazards (environmental factors) are important risk factors for falls [3, 15, 16]. In the present study, although specific home hazards are not specified for individuals who had falls and those who did not, elderly individuals reported accident/home hazards (31.2%) as the major reason for their falls. They also reported gait/balance deficit or muscle weakness (27.2%) as well as postural hypertension, dizziness, visual deficit, syncope and mobility limitation/osteoarthritis.

In common with other research, elderly individuals in our study reported these health issues following their falls: tissue injury (28%), fracture (5.8%) and fear of falling [again] (5.5%). Research by Stalenhoef et al[2] showed that falls resulted in injury in 45%, femur fracture in 2%, other fractures in 4% and minor injuries in 39% elderly studied. Although tissue injury is mostly seen as relatively minor, if tears in muscle and connective tissue are not treated promptly, long-term loss of functional and permanent disability may result. Fear of falling [again] is also a significant consequence of falls. Indeed, fear of falling may cause decreases in physical functions and disability to perform daily activities [17].

It has been reported that multiple risk factors can cause falls. Indeed results from the present study show that older age, female gender, low educational level, existence of a chronic disease, visual deficit, gait/balance deficit, urinary incontinence and polypharmacy are risk factors for the falls. These results are similar to those of some other studies in the literature[1, 15-17].

According to the logistic regression analyses, our data showed that urinary incontinence (also Chiarelli et al[16]), polypharmacy (also Kelly et al[18]) and gait/balance deficit (also Fabre et al[19]) were significantly correlated with falls in the elderly.

There was no significant difference between the marital status and fall history, although it has been reported that widowed/never married elderly individuals have more falls than married people. Çakar et al[20]performed studies on the quality-of-life of married elderly individuals and its effects on the risk of fall, and they found that the fall risk of married elderly individuals is lower than that of unmarried elderly individuals. This could result no physical and emotional support from spouses for those elderly individuals who are widowed/never married. Unlike previous studies, our study found a statistically significant difference between extended family structure and falls. It has been stated that elderly individuals who lived in a nuclear family fall more than the elderly individuals who either live in an extended family, alone, or with a caregiver. This result may be caused by individuals continuing their support roles even into an advanced age. In addition, it may be because of elderly individuals who lived in extended family and with a caretaker. Another major finding of this study is that being underweight is another fall risk factor, it is a similar finding was made by Patil et al[21]. A possible reason could be that underweight people are more active during the day so they may have an increased risk of falling.

With increasing numbers of elderly individuals in today's ageing society, physical, social and spiritual changes occur that may lead to disability. Indeed, in this study, half of the elderly stated that had severe disability. A multiple regression analysis, which was performed to identify the contributing variables that influence disability in the elderly, showed that the presence of chronic diseases, polypharmacy, visual deficit and gait/balance deficit were contributing variables. Indeed, Akın and Emiroğlu[22] demonstrated that chronic disease and polypharmacy were factors that influenced loss of mobility. In addition, Martin et al[23] suggested visual deficit as a factor. Van Heuvelen et al[24] indicated that deterioration in mobility is the single most important determinant of disability in the elderly. Moreover, according to a systematic study, a gait/balance deficit is an indicator of loss of abilities[25]. Another important finding in our study was that fall rate was higher for those elderly with only a mild disability ($p < 0.05$), whereas the fall rate decreased with severe disability. This may be related with reduction in movement and coordination skills in the elderly who have disability.

CONCLUSION

This study provided results related to the prevalence of falls in elderly individuals, risk factors for falls, causes for falling, health problems resulting from falls and disability. Indeed, falls and fall-related health problems are important in the elderly as they can cause significant morbidity and mortality.

Our study provides a much-needed platform for further epidemiological or prospective studies in this area. Nurses and other public health professionals must be made aware of the extent of this problem and the need to implement policies to decrease the risk of falls in older adults. In that regard, more home-based nursing care is needed for this

population. Health promotion strategies should include encouraging exercise for older adults by the provision of health education programs and appropriate community exercise facilities. Moreover, areas should be arranged where elderly individuals can safely and comfortably walk without needing help from others.

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