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ORIGINAL PAPER

HOW FALLS AND FEAR OF FALLING AFFECT THE PERFORMANCE OF DAILY ACTIVITIES IN INDIVIDUALS WITH KNEE OSTEOARTHRITIS

Pervin Kurtoglu[1], Sevinc Tastan[2], Servet Tunay[3]

[1]*Gulhane Training and Research Hospital, Ankara, Turkey*
[2]*Department of Nursing, Faculty of Health Sciences, Eastern Mediterranean University, Famagusta, North Cyprus via Mersin 10, Turkey*
[3]*Department of Orthopedics and Traumatology, 100. Yıl Hospital, Ankara, Turkey*

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Abstract

Aim: The aim of this quantitative study was to assess falls and fear of falling in patients with knee osteoarthritis, and to determine their effects on daily activities. *Design:* A descriptive and prospective quantitative study. *Methods:* The study employed a descriptive and prospective design, examining 93 patients with knee osteoarthritis. We used the Lequesne Index (LI), the Falls Efficacy Scale (FES), and the Visual Analog Scale for Fear of Falling (VAS-FOF) to assess the effects of falls and fear of falling on daily activities. *Results:* The mean age of participants was 62.0 years old. In total, 78.5% of patients had experienced falls in the past, 53.4% of whom were admitted to hospital as a result. There was a positive significant correlation between total mean Lequesne Index and VAS-FOF scores, age, and BMI of participants ($r = 0.310$; $r = 0.231$; $r = 0.283$) ($p < 0.05$). A negative correlation was found between FES and VAS-FOF scores, total LI score, and age ($p < 0.05$). In addition, a negative significant correlation was found between age and BMI ($r = -0.257$) ($p < 0.013$). *Conclusion:* The results demonstrated that fear of falling affects the performance of daily activities. Knee osteoarthritis is an important risk factor for falling, and falls affect daily activities in those with knee osteoarthritis.

Keywords: daily activities, fall risk, falling, fear of falling, knee osteoarthritis.

Introduction

The World Health Organization (WHO) defines a fall as an event in which a person comes to rest inadvertently on the ground or lower than his/her level. Every year, approximately 28%–35% of individuals aged 65 and above fall; this ratio increases to 32%–42% in people aged 70 and above (World Health Organization, 2007). Every year, falls result in injuries to three million elderly individuals globally. In the past ten years, the rate of falling among elderly individuals has increased, making falls even more significant (Centres for Disease Control and Prevention, 2017). Falls and their associated injuries have become a major problem for health and social care providers. Falls can cause health problems and adversely affect quality of life. In addition, falling places a significant financial burden on both society and families, as it increases health problems and related costs (Trepainer & Hilsenbeck, 2014).

Falls may cause fractures, tissue injuries, loss of confidence, fear of further falling, and even death (Cheung et al., 2017; Kim et al., 2011; Soy Bugdaycı et al., 2012). The fear of falling may cause feelings of inadequacy, affect an individual's confidence in performing daily activities, and result in a less active lifestyle. Falls may also cause depression by decreasing functionality in sufferers (Fukutani et al., 2016; Ng & Tan, 2013). Gait changes and disorders may be encountered in individuals due to fear of falling, which in turn increases the risk of falling by causing muscle atrophy and weakness, particularly in the lower extremities (Uz Tuncay et al., 2011).

Knee osteoarthritis (OA) increases the risk of falling (Cheung et al., 2017; Uz Tuncay et al., 2011). Between 2010 to 2031, it is estimated that the prevalence of OA will increase from 13.8% to 18.6% (Sharif et al., 2015). In patients with knee OA, body proprioception changes, which may affect postural stability. It is important to maintain postural stability during activities of daily living and mobility. Distorted postural stability is one of the main causes of falls in older adults, and is a major health problem (Khalaj et al., 2014). Therefore, knee OA causes injury and restricts an individual physically, socially, and psychologically, decreasing their ability to perform certain functions, such as getting up from a seat, and ascending and descending stairs.

Corresponding author: Pervin Kurtoglu, Gulhane Training and Research Hospital, General Dr. Tevfik Saglam Cd. Etlik / Ankara Turkey; email: pervingky@gmail.com

In patients with knee OA, biological changes that occur due to aging also increase the risk of falling. A history of falls may cause fear of future falls. In the literature, many previous studies have examined falls and fear of falling among elderly people (Ng & Tan, 2013; Tinetti et al., 1990; Uz Tuncay et al., 2011). However, no studies to date have evaluated the experience of falling, fear of falling, and the daily functioning of individuals with knee OA. This study provides the necessary data for fall-prevention initiatives by determining avoidable risk factors in individuals with knee OA. Additionally, it provides data on how to reduce the fear of falling in individuals with knee OA, which can be used to enhance individuals' independence and functioning. The purpose of this study was to evaluate the effect of knee OA on the functioning and the performance of daily activities of individuals by assessing their fall experiences and their fear of falling.

Aim

The aim of this quantitative study was to assess falls and fear of falling in patients with knee osteoarthritis, and to determine their effects on daily activities.

Methods

Design

The study employed a descriptive and prospective quantitative study design.

Sample

The study was carried out at the Orthopedics and Traumatology Department of a university hospital in Ankara, Turkey, between January and April 2013.

The study group consisted of outpatients of the Orthopedics and Traumatology Department diagnosed with knee OA according to the diagnostic criteria of the American College of Rheumatology. Those who were younger than 18 years, unconscious, wheelchair-bound, or who had undergone surgery for knee or hip prostheses were excluded from the study. The study was completed with 93 outpatients who met the sampling criteria.

Data collection

Data from the study were obtained from outpatients who had visited the Orthopedics and Traumatology Department, been diagnosed with OA, and met study criteria. Data were collected by a researcher using the survey, in a patient room. The survey took approximately 15 to 20 minutes to administer.

Data were collected by means of a survey, which was modified after examining those used in previous studies (Basaran et al., 2010; Duyur Çakıt et al., 2011; Ng & Tan, 2013; Tinetti et al., 1990). It was divided into two sections. The first section consisted of 24 items, including socio-demographic information (e.g., age, gender, education, profession, BMI, and whether the individual lived alone), and information on disease status (duration of OA, treatments relevant to OA, medications, auxiliary tools associated with gait, and falling experiences). BMI was divided into two categories: < 30 kg/m^2 and ≥ 30 kg/m^2, in order to evaluate the possible relationship between obesity and functionality of patients (Masiero et al., 2018; Rosales Ade et al., 2014). The Ahlbäck radiological classification was used for staging knee OA in patients. Ahlbäck classification consists of five grades (Martins et al., 2017):

- Grade 1: Narrowing of the joint space (< 3 mm)
- Grade 2: Obliteration of joint space
- Grade 3: Minimal erosion in the joint (between 0–5 mm)
- Grade 4: Moderate erosion in the joint (5–10 mm)
- Grade 5: Severe erosion (> 10 mm) in the joint, subluxation, arthrosis in the secondary lateral compartment.

The second section consisted of the Visual Analog Scale for Fear of Falling (VAS-FOF), the Lequesne Index (LI), and the Tinetti Falls Efficacy Scale (FES).

The Visual Analog Scale for Fear of Falling (VAS-FOF)

The VAS-FOF was used to determine fear of falling in individuals diagnosed with knee OA. Participants' fears of falling were assessed, and represented on a scale of 0–10 on a 10 cm line, with 0 being "I am not afraid of falling" and 10 being "I am very afraid of falling" (Scheffer et al., 2010).

The Lequesne Index (LI)

The LI consists of three subscales that evaluate the performance of daily activities in individuals diagnosed with knee and hip OA. The first subscale includes five questions assessing pain and discomfort (night pain, morning stiffness, pain while walking, and increased pain in standing), the second subscale includes one question evaluating maximal walking distance, and the third subscale includes four questions evaluating activities of daily living (ascending/descending stairs, squatting, and walking). The LI evaluating the impact of knee OA on functioning and daily quality of life was used in this study. Total LI score ranges from 0 (no pain, no disability) to 24 (maximum pain, stiffness and disability) (Lequesne, 1991). The LI is assessed

on a scale: 1–4 points for mild impact (1st degree), 5–7 points for moderate impact (2nd degree), 8–10 points for severe impact (3rd degree), 11–13 points for very severe impact (4th degree), and 14+ for extremely severe impact (5th degree). The validity and reliability of the LI were evaluated for the Turkish version, and the scale was used to evaluate individuals diagnosed with knee OA. The Cronbach's alpha coefficient is 0.61–0.71 for groups with knee OA (Basaran et al., 2010).

Falls Efficacy Scale (FES)

Tinetti et al. (1990) developed a scale to assess an individual's perceptions of their own efficiency or reliability in performing daily activities following a fall (e.g., house cleaning, dressing, or shopping). The FES contains 10 items, each measured on a scale of 0–10, with respondents assigning points for each question between 0 (not reliable) and 10 (very reliable). A total score between 0 (low efficiency following a fall) and 100 (high efficiency following a fall) is obtained when all points are totalled. The reliability and validity of the FES have been proven in studies, and the Pearson's correlation is 0.71 (Duyur Çakıt et al., 2011; Tinetti et al., 1990; Uz Tuncay et al., 2011).

Data analysis

Data were analyzed using SPSS version 15.0 software (Student Package of Social Sciences Inc. Chicago, IL, USA). Analysis employed Wilcoxon tests, Mann Whitney U tests, Kruskal Wallis tests, and Student t-tests. For descriptive statistics, number and percentage (%) were used for numerical variables and mean ± standard deviation ($\overline{X}$ ± SD), and median and minimum-maximum (min–max) for measurable variables.

Results

The distribution of some of the demographic information of patients is presented in Table 1.

Female patients comprised 91.4% (n = 85) of study participants. The mean age of participants was 62 ± 9.6 years. Body mass index (BMI) was ≥ 30 kg/m^2 in 54.8% (n = 51) of the participants, and < 30 kg/m^2 in 45.2% (n = 42) of participants.

The distribution of risk factors for falls is shown in Table 2.

Individuals classified as having fourth-degree impact according to the Ahlbäck OA radiological system comprised 40.9% (n = 38) of participants. In addition, 54.8% (n = 51) of participants had hypertension, and 20.5% (n = 19) had diabetes. Problems with vision were detected in 72% of participants (n = 67).

Walking sticks were used by 9.7% of participants (n = 9). Of these, 45.2% (n = 42) experienced dizziness, 36.6% (n = 34) had urinary incontinence problems, and 75.3% (n = 70) experienced gait/balance problems. In total, 78.5% of participants (n = 73) reported having fallen in the past, 53.4% (n = 49) of whom were admitted to hospital as a result.

Table 1 Distribution of certain introductory characteristics of patients (n = 93)

Characteristics	**mean**	**SD**
age	62	± 9.6
	n	**%**
Gender		
female	85	91.4
male	8	8.6
Marital status		
married	91	97.8
single	2	2.2
Education		
not literate	18	19.4
primary education	51	54.8
high school	12	12.9
college and higher	12	12.9
Work status		
working	6	6.4
not working	69	74.2
retired	18	19.4
student	-	-
People living with patient		
alone	11	11.8
spouse-child	81	87.1
caretaker	1	1.1
Smoker		
yes	7	7.5
no	86	92.5
Drinker (of alcohol)		
yes	2	2.2
no	91	97.8
BMI		
< 30 kg/m^2	42	45.2
≥ 30 kg/m^2	51	54.8

SD – standard deviation; BMI – Body Mass Index

Baseline characteristics of participants, data reflecting fear of falling, LI scores, and the comparison of FES score averages are shown in Table 3. According to these data, the mean LI scores of the female participants were significantly higher (p = 0.001). In addition, it was found that VAS-FOF mean scores were higher in patients with visual problems, whereas their FES scores were significantly lower (p = 0.009; p = 0.012, respectively).

Table 2 Distribution of certain characteristics of participants / fall risk factors (n = 93)

Characteristics	n	%
Grade of the disease		
grade 1	13	14.0
grade 2	26	28.0
grade 3	16	17.1
grade 4	38	40.9
grade 5	-	-
Co-morbidities		
hypertension	51	54.8
diabetes	19	20.5
osteoporosis	5	5.4
cataract	7	7.5
CVD	11	11.8
Visual problems		
yes	67	72.0
no	26	28.0
Use of hearing aids		
yes	4	4.3
no	89	95.7
Use of auxiliary tool		
walking stick	9	9.7
crutch	4	4.3
walker	2	2.2
Dizziness		
yes	42	45.2
no	51	54.8
Urinary incontinence		
yes	34	36.6
no	59	63.4
Gait and balance problems		
yes	70	75.3
no	23	24.7
Experience of falling		
yes	73	78.5
no	20	21.5
Hospital admission of patients with experience of falling		
yes	49	53.4
no	44	46.6

CVD – Cardio-vascular diseases

The LI points of participants increased significantly ($p \leq 0.001$) with an increase in disease severity,while FES points fell significantly ($p = 0.009$). The LI and VAS-FOF were higher in participants with gait/balance problems than in those without ($p = 0.012$ and $p \leq 0.001$, respectively). The FES scores for those with these problems were significantly lower ($p = 0.004$) than for the group without gait/balance problems. Mean FES points were significantly lower in participants with previous fall experience ($p = 0.045$). No significant difference was found between VAS-FOF, LI, and FES scores and co-morbidities status, smoking, or living with others ($p > 0.05$).

Correlational analysis between participants' age, BMI, and VAS-FOF, LI, and FES scores is shown in Table 4. There was a positive and statistically significant correlation between total mean LI score and VAS-FOF, age, and BMI of participants ($r = 0.310$; $r = 0.231$; $r = 0.283$, respectively) ($p < 0.05$). A negative and significant correlation was found between FES and VAS-FOF scores, LI total score, and age ($r = -0.425$; $r = -0.361$; $r = -0.206$, respectively) ($p < 0.05$). In addition, a negative significant correlation was found between age and BMI ($r = -0.257$; $p < 0.05$).

Table 3 Comparison of VAS-FOF, Lequesne Index and FES scores, according to participants' characteristics

Characteristics	VAS-FOF		LI		FES	
	median ± SD	p-value	median ± SD	p-value	median ± SD	p-value
Gender		p = 0.064		p = 0.001		p = 0.056
female	5.0 ± 3.1	u = 206.0	13.0 ± 4.0	u = 89.5	74.0 ± 26.3	u = 201.0
male	3.5 ± 2.9	z = -1.854	7.0 ± 3.8	z = -3.44	94.0 ± 18.1	z = -1.901
Education						
not literate	5.5 ± 3.5		14.5 ± 2.0		56.5 ± 3.0	
primary school	5.0 ± 3.1	p = 0.809	12.0 ± 4.5	p ≤ 0.001	72.0 ± 2.5	p = 0.093
high school	5.0 ± 2.7	x^2 = 0.967	10.0 ± 3.0	x^2= 23.17	81.0 ± 3.0	x^2 = 6.42
college – higher	5.0 ± 3.7		7.5 ± 4.0		92.5 ± 2.0	
Work status						
working	3.5 ± 4.5	p = 0.676	6.5 ± 4.6		97.0 ± 27.4	
not working	5.0 ± 3.1	x^2 = 0.783	13.0 ± 3.7	p = 0.001	72.0 ± 3.7	p = 0.87
retired	5.0 ± 3.1		9.5 ± 5.1	x^2=14.47	82.5 ± 26.9	x^2= 3.35
student	-	-	-		-	
Visual problems		p = 0.009		p = 0.204		p = 0.012
yes	9.0 ± 3.2	u = 96.00	15 ± 4.3	u = 180.0	49.0 ± 25.5	u = 101.5
no	5.0 ± 3.0	z = -2.605	12 ± 4.5	z = -1.271	78.0 ± 27.7	z = -2.501
Grade of the disease						
grade 1	5.0 ± 2.9		8.0 ± 3.2		94.0 ± 22.1	
grade 2	5.0 ± 2.8	p = 0.256	10.5 ± 4.3	p ≤ 0.001	79.5 ± 21.5	p = 0.009
grade 3	2.3 ± 3.7	x^2= 4.054	12.0 ± 3.8	x^2 = 26.75	95.5 ± 31	x^2= 11.52
grade 4	5.5 ± 3.2		14.0 ± 3.5		61.0 ± 25.5	
grade 5	-		-		-	
Gait/balance problems		p = 0.012		p ≤ 0.001		p = 0.004
yes	5.0 ± 3.0	u = 524	13.0 ± 3.6	u = 300.0	68.0 ± 25.6	u = 480.5
no	4.0 ± 3.1.	z = -2.526	8.0 ± 4.2	z = -4.512	97.0 ± 22.7	z =- 2.897
Falling experience		p = 0.512		p = 0.829		p = 0.045
yes	5.0 ± 3.2	u = 660.5	12.0 ± 4.6	u = 707.00	72 ± 27.2	u = 516
no	5.0 ± 3.1	z = -0.656	12.5 ± 4	z = -0.216	87 ± 17.8	z = -2.007
Knee surgery		p = 0.158		p = 0.178		p = 0.011
yes	5.5 ± 2.6	u = 238.0	13.0 ± 3.6	u = 242.0	54 ± 20.0	u = 55.0
no	5.0 ± 3.2	z = -1.411	12.0 ± 4.4	z = -1.347	78 ± 25.7	z = -2.542

VAS-FOF – Visual Analog Scale for Fear of Falling; LI – Lequesne Index; FES – Tinetti Falls Efficacy Scale; u = Mann-Whitney U Test; x^2 – Chi-square Test

Table 4 Correlation between participants' Fear of Falling, Lequesne Index, FES, BMI, and age

		VAS-FOF	LI (Total Score)	FES Score	Age	BMI
VAS-FOF		-	-	-	-	-
LI (Total Score)	r	0.310				
	p	0.002	-	-	-	-
	n	93				
FES Score	r	-0.425	-0.361			
	p	≤ 0.001	≤ 0.001	-	-	-
	n	93	93			
Age	r	0.020	0.231	-0.206		
	p	0.851	0.026	0.047	-	-
	n	93	93	93		
BMI	r	0.055	0.283	0.019	-0.257	
	p	0.600	0.006	0.859	0.013	-
	n	93	93	93	93	

VAS-FOF – Visual Analog Scale for Fear of Falling; LI – Lequesne Index; FES – Tinetti Falls Efficacy Scale; BMI – Body Mass Index; r = Pearson's correlation coefficient

Discussion

This study reveals the effect of previous falls and the fear of falling on the daily activities of individuals diagnosed with knee OA. Studies have emphasized that there is a correlation between certain patient demographics and previous falls, and the subsequent fear of falling (Duyur Çakıt et al., 2011; Kim et al., 2011; Tinetti et al., 1990; Uz Tuncay et al., 2011). In this study, LI scores increased with advancing age, and participants saw a decrease in their ability to carry out daily activities. In a study performed by Cetin et al. (2009) on 56 patients diagnosed with OA, there was no correlation between patients' age and total LI score. On the other hand, in a study performed on 52 patients varying in age between 31 and 80 years, a positive relationship was found between increasing age and LI score (Adegoke et al., 2012), which was similar to the present study. Age is a crucial factor for OA, since advancing age causes changes in joint cartilage, which is associated with the disease (Mirmaroofi et al., 2019; Ng & Tan, 2013). Elderly people with knee OA who are admitted to health centers must be evaluated more carefully for risk of falling, and any disease the individual may have must be considered in fall prevention initiatives. Falls can be prevented when these individuals carry out their daily activities under supervision or in the company of an attendant.

In this study, the LI scores of participants increased with disease severity, while FES scores decreased. In the study performed by Cetin et al. (2009), there was no difference between LI scores and disease severity. In contrast, a study by White et al. (2010) found that functional restrictions in patients were associated with progression in the radiological grade of the disease, similar to the results of the present study. As the disease progresses in severity, balance problems related to knee pain and muscle weakness can occur (Cheung et al., 2017). These changes cause restrictions in functioning, and thus reduce patients' ability to perform daily activities. In light of these results, patient complaints should be taken into account, along with radiological findings in the diagnosis, treatment, and care applications for patients with knee OA when planning fall prevention interventions. In addition, training should be provided to patients requiring auxiliary aids due to balance problems and disease.

In this study, we observed that women's LI scores were higher than men's, whereas their FES points were lower. In the study by Cetin et al. (2009), women's total LI scores were significantly elevated. Using the Western Ontario and McMaster Universities (WOMAC) scale, which is similar to the LI scale, Akhavan et al. (2018) found higher scores in women for physical functionality and performance of daily activities. In our study, FES scores associated with falling and fear of falling were lower in women, and there was a negative correlation between LI and FES scores (Table 3). Women with knee OA had lower scores related to the performance of daily activities and physical functioning, than men with the same diagnosis (Cetin et al., 2009; Mirmaroofi et al., 2019). Moreover, the fear of falling and the risk of falling were higher in women (Uz Tuncay et al., 2011). Some of the contributing factors include the individuals' perceptions of pain and functioning, and societal standards and expectations, in addition to anatomical changes, the impact of sex hormones, and gender-based variation in analgesic effects (Mirmaroofi et al., 2019). The fear of falling is, in itself, a risk factor for falls (Duyur Çakıt et al., 2011; Uz Tuncay et al., 2011). When determining fall risk, contributing factors include functionality, fear of falling, and any undesired effects of the fear of falling. Accordingly, we should evaluate individuals holistically, with their biological and psychosocial characteristics, in order to increase their functionality and improve their quality of life.

In a study by Malini et al. (2016), 46.6% of patients without visual impairment and 61% of patients with visual impairment experienced fear of falling. Cataracts cause visual impairment and are a significant cause of falls (Keay et al., 2014). Studies show that fall incidence of patients with cataract diagnosis are higher (Keay et al., 2014; Malini et al., 2016). In our study, it was found that VAS-FOF and FES scores of patients with cataract diagnosis were worse than for patients without. On this basis, attention should be given to precautions to prevent falls in patients with cataract diagnosis. Environmental regulations such as adequate lighting are particularly important in preventing falls.

In this study, the majority of individuals had gait and balance problems, contributing to a greater fear of falling. In other studies, patients with knee OA reported balance problems (Cheung et al., 2017; Gürkan et al., 2010). In our study, a positive correlation was found between fear of falling and total LI scores. In individuals with OA who reported balance problems, LI scores were high, while FES scores were low. In previous reports, patients with knee OA experiencing balance problems had impaired physical functioning abilities, which negatively influenced their quality of life (Cheung et al., 2017; Duyur Çakıt et al., 2011). In the literature, exercise is recommended to improve the physical condition and functionality of OA patients (Cheung

et al., 2017; Juhl et al., 2014). Exercise reduces pain, improves posture, provides balance control, improves flexibility, and strengthens muscles (Cheung et al., 2017; Juhl et al., 2014). Improvement in physical function reduces fear of falling in elderly patients. Exercises focusing on the endurance and strength of the knee muscles are particularly useful for balance and self-confidence in patients (Ahn & Ham, 2019; Juhl et al., 2014). Group exercises, patient-specific home-based exercises, or indoor and outdoor exercises will increase patient functionality and reduce fear of falling. Exercise encourages patient self-management of the disease and improves performance of activities of daily living (Ahn & Ham, 2019; Cheung et al., 2017; Juhl et al., 2014).

Balance is impaired in individuals with knee OA, which increases the risk of falling (Oka et al., 2019; Uz Tuncay et al., 2011). A high fear of falling may increase an individual's dependence on others over time, causing avoidance of daily activities and functional retardation, decreasing quality of life. Fear of falling may also cause physical, psychological, and functional problems in individuals, and so fear of falling in knee OA patients should be thoroughly evaluated (Cheung et al., 2017; Oka et al., 2019). Medical staff in close contact with patients should be aware of the effect that fear of falling has on a person's ability to perform daily activities. In particular, individuals with more sedentary lifestyles should be encouraged to perform activities, to the best of their abilities. Wherever possible, risk factors that cause fear of falling should be reduced by improving basic health conditions and increasing the physical activity of individuals (Cheung et al., 2017; Ng & Tan, 2013). Providing a safe home and hospital environment for individuals with a fear of falling contributes to increasing their independence in performing daily activities, as well as feelings of confidence and well-being.

Previous falls are also a risk factor affecting the likelihood of future falls. Duyur Çakıt et al. (2011) examined two groups of women (84 females with rheumatoid arthritis, and 44 healthy females), and found that FES scores assessing fear of falling in individuals with previous fall experiences were higher compared to those who had not experienced a fall. Similarly, FES scores in 105 elderly patients with previous fall experience were significantly lower than for other elderly patients who had not experienced a fall (Uz Tuncay et al., 2011). In the present study, a negative correlation was observed between VAS, fear of falling, and FES scores in individuals with previous fall experience compared to those without. In other words, feelings of safety in performing daily activities decrease with increased fear of falling. In our study, a positive correlation was found between fear of falling, and functioning and performance of daily activities. Functions such as getting up from a chair, walking, and squatting are poorer in individuals with increased fear of falling than in those without (Duyur Çakıt et al., 2011; Uz Tuncay et al., 2011). Fear of falling leads to avoidance of daily activities such as shopping, and taking a shower; it also causes functional retardation, limiting the individual socially, increasing the risk of future falls, and impairing quality of life.

In the present study, a direct correlation was found between total LI scores and a higher BMI (Masiero et al., 2018). In a study performed by Rosales Ade et al. (2014) on 38 patients diagnosed with OA, it was found that weight loss improves patient functionality and performance of activities of daily living. High BMI negatively affects the knee joints of patients by causing abnormal loading on knees and impairing joint bio-mechanisms. Obesity means more muscle strength is required to perform daily activities, which impairs physical functions (Masiero et al., 2018; Ng & Tan, 2013). A noticeable improvement in physical functioning can be achieved by including exercises that do not add force to the knee joint, and that are appropriate to the patients' abilities, and by implementing nutritional weight loss programs in educational initiatives targeting these patients. Training these patients in weight control is crucial, and individuals living with the patient should also be included in the training.

One limitation of this study is our inability to generalize the results to all individuals with OA. However, this study could be repeated with a larger study group in the future. In addition, the gait and balance problems of patients were evaluated according to researcher observation and patient reporting. In future studies, the presence of gait and balance problems could be assessed with appropriate balance tests and scales.

Conclusion

The study indicates that all individual factors such as disease status, age, gender, fear of falling, functionality, and fall experience should be considered when determining the risk of future falls in individuals. Since knee OA leads to physical and functional impairments in individuals, it is an important risk factor for falls. When evaluating OA, health professionals must consider risk factors for falling alongside patients' fear of falling and fall experiences as risk factors for future falls. Personal and environmental interventions should be designed, with the input of patients and their families, for the

home or hospital environment of high-risk individuals. Individual or group trainings to reduce the risk of falling and to manage the fear of falling, and programs designed for regular exercise, should also be included in these interventions. Future studies should focus on overcoming fear of falling in patients with such fears.

Ethical aspects and conflict of interest

There were no personal conflicts of interest. There was no financial conflicts of interest.

The study was approved by the Ethics Committee of Gulhane Military Medical Academy, Ankara, Turkey, where the study was conducted (No: 1491-206-12/1648.4-5535). Participants were informed about the research and gave their informed consent, both verbally and in writing. Participants were assured that they could leave the study at any time and that their anonymity would be protected.

Author contributions

Study design and concept (PK, ST, ST), data collection (PK), data analysis, manuscript preparation, and critical revisions for important intellectual content (PK, ST, ST).

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