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Factors Associated with Functional Mobility in Women with Symptomatic Knee Osteoarthritis

Semptomatik Diz Osteoartritli Kadınlarda Fonksiyonel Mobilite ile İlişkili Faktörler

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ABSTRACT Objective: Knee osteoarthritis causes more pain and disability in women. The study aims to investigate the factors associated with functional mobility in women with symptomatic knee osteoarthritis. **Material and Methods:** This cross-sectional study included 78 women with knee osteoarthritis. Functional mobility and balance were evaluated using Timed Up and Go test and Berg Balance Scale. Moreover, Knee Injury and Osteoarthritis Outcome Scale and Hospital Anxiety and Depression Scale were used. **Results:** The mean age was 64.9±7.5. The mean disease duration was 7.9±6.7 years. The mean body mass index was 32.4±5.2 kg/m². The mean Timed Up and Go test duration was 32.5±5.2 s. The mean Hospital Anxiety and Depression Scale-Anxiety and Depression scores were 9.3±5.7 and 6.5±4, respectively. The mean Berg Balance Scale score was 49.4±6.5. Significant correlations were found between Timed Up and Go test time and age, body mass index, Hospital Anxiety and Depression Scale-Anxiety and Depression, Berg Balance Scale, Knee Injury and Osteoarthritis Outcome Scale symptom and quality of life (the correlation coefficients were 0.357, 0.240, 0.302, 0.246, -0.379, -0.236 and -0.229, respectively). The binary logistics regression analysis revealed that Berg Balance Scale was an important risk factor for abnormal Timed Up and Go (Hosmer-Lemeshow test p=0.440) **Conclusion:** Low functional mobility in women with symptomatic knee osteoarthritis is associated with advanced age, high body mass index, impaired emotional state, impaired balance and poor quality of life in this study. Poor balance was the most important risk factor for functional mobility.

Keywords: Knee; postural balance; osteoarthritis; functional mobility

ÖZET Amaç: Diz osteoartriti, kadınlarda daha fazla ağrı ve sakatlığa neden olur. Çalışma, semptomatik diz osteoartriti olan kadınlarda fonksiyonel mobilite ile ilişkili faktörleri araştırmayı amaçlamaktadır. **Gereç ve Yöntemler:** Bu kesitsel çalışmaya, diz osteoartriti olan 78 kadın dâhil edildi. Fonksiyonel mobilite ve denge, Timed Up and Go testi ve Berg Denge Ölçeği kullanılarak değerlendirildi. Ayrıca Diz Yaralanması ve Osteoartrit Sonuç Ölçeği ve Hastane Anksiyete ve Depresyon Ölçeği kullanıldı. **Bulgular:** Ortalama yaş 64,9±7,5 idi. Ortalama hastalık süresi 7,9±6,7 yıldı. Ortalama beden kitle indeksi 32,4±5,2 kg/m² idi. Timeed Up and Go test süresi ortalama 32,5±5,2 sn idi. Ortalama Hastane Anksiyete ve Depresyon Ölçeği-Anksiyete ve Depresyon puanları sırasıyla 9,3±5,7 ve 6,5±4 idi. Ortalama Berg Denge Ölçeği puanı 49,4±6,5 idi. Timed Up and Go test süresi ile yaş, beden kitle indeksi, Hastane Anksiyete ve Depresyon Ölçeği-Anksiyete ve Depresyon, Berg Denge Ölçeği, Diz Yaralanması ve Osteoartrit Sonuç Ölçeği semptom ve yaşam kalitesi arasında anlamlı korelasyonlar bulundu (korelasyon katsayıları, sırasıyla 0,357, 0,240, 0,302, 0,246, -0,379, -0,236 ve -0,229). İkili lojistik regresyon analizi, Berg Denge Ölçeğinin anormal Timed Up and Go için önemli bir risk faktörü olduğunu ortaya koymuştur (Hosmer-Lemeshow testi p=0,440) **Sonuç:** Semptomatik diz osteoartriti olan kadınlarda düşük fonksiyonel mobilite, ileri yaş, yüksek vücut kitle indeksi, bozulmuş duygusal durum, bozulmuş denge ve düşük yaşam kalitesi ile ilişkilidir. Azalmış denge, fonksiyonel hareketlilik için en önemli risk faktörüydü.

Anahtar Kelimeler: Diz; postural denge; osteoartrit; fonksiyonel mobilite

Problems arising due to lower extremity osteoarthritis, such as pain, stiffness, decreased range of motion and muscle strength, joint instability, impaired proprioception and balance problem, may contribute to the development of functional impairment and disability. Being overweight, comorbidities, emotional impairments, such as anxiety and depression, cognitive disorders and visual and hearing loss are the other factors that can contribute to overall functional decline.[1-2]

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The aim to rehabilitate people with knee osteoarthritis is to improve the functional level and independence in the activities of daily living (ADL) besides reducing pain and other symptoms. Therefore, functional mobility assessment is necessary in these people. Mobility level can be determined by conducting performance tests or using self-assessment scales by the physician in a clinical setting. Developed by Podsiadlo and Richardson in 1991, the timed up and go (TUG) test is a performance-based practical test, which is based on the get-up and go test.[3] This test can be used to evaluate mobility in different age groups and in patients with different diseases, including osteoarthritis. The TUG test is useful in assessing mobility disorders in adults of all ages as well as in elderly people.[4] In the evaluation of pain and function in lower extremity osteoarthritis, performance-based tests, such as TUG and six-minute walk test, are thought to have a different effect than self-assessment tests.[5]

Knowing the factors related with functional status in knee osteoarthritis may be helpful in making appropriate treatment decisions. This study aims to investigate the factors associated with functional mobility measured using the TUG test in women with symptomatic knee osteoarthritis.

MATERIAL AND METHODS

This cross-sectional study included a total of 78 female patients (>50 years of age) who were admitted to an outpatient clinic. They were diagnosed with symptomatic knee osteoarthritis according to the criteria established by the American College of Rheumatology.[6] Symptomatic osteoarthritis usually means pain or stiffness along with the findings of radiological osteoarthritis in the joint.[7] Patients with collagen tissue diseases, such as rheumatoid arthritis, infectious arthritis in the lower extremities, malignancy, history of fracture or arthroplasty, peripheral neuropathy, radiculopathy, myopathy, knee surgery and communication problems were excluded from the study. Demographic characteristics and physical examination findings were recorded for all patients. The study protocol was approved by the Bakırköy Sadi Konuk Training and Research Hospital's Ethics Committee (no: 2019/109, date: 04.03.2019). Written informed consent was obtained from all individual participants included in the study. The study was conducted in accordance with the principles of the Declaration of Helsinki.

MEASUREMENTS

Timed Up and Go Test

TUG is a reliable and valid test to evaluate functional mobility.[3] The TUG test is performed by measuring the time required to stand up from the chair, walk 3 m on the floor, turn around, return and sit down again. All patients in this study were informed about the procedure before the test. They wore comfortable shoes for the test. The test was repeated three times, and test durations were recorded in seconds. The mean value of these three tests was calculated. All the measurements were performed by the same clinician. The reference values for age groups 60-69 years was 8.1 s (95% CI 7.1, 9.0); 70-79 years was 9.2 s (95% CI 8.2, 10.2) and 80-89 years was 11.3 s (95% CI 10.0, 12.7). A test period of <10 s was accepted as normal for the elderly people under 80 years of age.[4]

KNEE INJURY AND OSTEOARTHRİTİS OUTCOME SCORE

Knee Injury and Osteoarthritis Outcome Score (KOOS) is a knee-specific self-assessment test that was developed from the Western Ontario and McMaster Universities Osteoarthritis Index.[8] KOOS can be used in patients with both post-traumatic stress and primary osteoarthritis.[9] KOOS consists of 42 items in five different subscales, including pain, other symptoms, ADL, sport and recreation function and knee-related quality of life (QoL). Each item is scored 0-4 and the results are converted into values between 0 and 100. A score of 0 indicates a severe knee problem, whereas a score of 100 indicates no knee problem. Transformation is performed by obtaining the percentage of the score received by the maximum score for each subscale and subtracting this result from 100. The Turkish validity and reliability study of KOOS has been performed.[10]

HOSPİTAL ANXİETY AND DEPRESSİON SCALE

Hospital Anxiety and Depression Scale (HADS) is a practical and reliable screening test to assess anxiety

and depression status. At first, HADS was developed for hospitalised patients, but now it can be used for both inpatients and outpatients. Patients' feelings during the last week were questioned in the HADS test.[11] The test can be completed in 2-5 min. This scale, which has a two-factor structure, consists of 14 items, where the first seven items assess the anxiety status and the remaining seven evaluate depression. The items are scored on a four-point scale. The total score ranges between 0 and 21 for anxiety and depression. Scores between 0 and 7 show a normal emotional status. Zigmond and Snaith reported that scores greater than 7 on the anxiety or depression subscales of the HADS indicate anxiety and depression.[12] The validity and reliability study of the Turkish version of HADS has been shown in studies involving healthy college students, hospitalised patients and people with spinal cord injuries.[13,14]

BERG BALANCE SCALE

The Berg Balance Scale **(**BBS) is a 14-item test that is used to assess the self-perceived balance among individuals.[15] The total score ranges between 0 and 56, with higher scores indicating a better balance. The validity and reliability study of the Turkish version of BBS has been studied.[16]

STATİSTİCAL ANALYSİS

The Kolmogorov-Smirnov test and graphic methods (histogram, Normal Q-Q Plot) were used to test if the data were normally distributed. Descriptive analyses were presented using arithmetic mean and standard deviation for normally distributed variables or median and interquartile range for non-normally distributed variables. During the investigation of the associations between non-normally distributed and/or ordinal variables, the correlation coefficients and their significance were also calculated using the Spearman test. Results with a "*p*" value of <0.05 were considered to be statistically significant. Multivariate binary logistic regression analysis was performed to determine the risk factors for abnormal TUG. Using the forward conditional method, the p value for a factor to be included in the regression model was calculated to be 0.05, and the p-value for exclusion was 0.1. Suitability of the regression model was reviewed using the Hosmer-Lemeshow test. The regression model was considered statistically suitable if the p-value found with the Hosmer-Lemeshow test was <0.05. The 95% confidence intervals were calculated for the odds ratios [Exp (B)]. Wald statistical analysis was conducted to determine the significance of coefficient B. Data were analysed using PASW Statistics software (SPSS Inc., Chicago, IL, USA). G*power software (ver 3.1.9.4, Franz Paul, Universitat Kiel, Germany) was used for the post hoc power analysis.

RESULTS

Demographic and clinical characteristics of female patients with knee osteoarthritis included in this study are summarised in Table 1. A total of 22 patients (28.2%) were overweight, whereas 53 (77.3%) were obese. Only 3.5% of patients had normal weight. A total of 67 patients had bilateral and 11 had unilateral knee osteoarthritis. In total, 43 patients (55%) had anxiety disorders and 34 (43.6%) had depression. The mean TUG test values are shown in Table 2. There was a significant correlation between TUG test and age, body mass index (BMI), HADS-Anxiety (HADS-A), HADS-Depression (HADS-D), BBS, KOOS symptom and QoL scores (Table 3). Binary

TABLE 1: Demographic and clinical characteristics.

	Minimum	Maximum	Mean	SD
Age (years)	50.0	85.0	64.9	7.5
Height (cm)	147.0	170.0	156.4	5.5
Body weight (kg)	55.0	116.0	79.4	13.1
BMI (kg/m2)	22.0	48.9	32.5	5.2
Education (years)	0	12.0	3.2	3.6
Disease duration (years)	1	30.0	7.9	6.7
TUG (s)	7.3	20.0	12.4	3.5
HADS-A	0	20.0	9.3	5.7
HADS-D	0	16.0	6.5	4.0
BBS Score	22.0	56.0	49.4	6.5
KOOS-Symptoms	5.0	96.0	55.6	20.5
KOOS-Pain	0	97.0	46.0	19.4
KOOS-Daily living	3.0	100.0	46.7	19.2
KOOS-Sports	0	100.0	17.9	19.6
KOOS-Quality of life	0	69.0	32.7	17.6

SD: Standard deviation; BMI: Body mass index; TUG: Time up and go; HADS-A: Hospital Anxiety and Depression Scale-Anxiety; HADS-D: Hospital Anxiety and Depression Scale-Depression; BBS: Berg Balance Scale; KOOS: Knee Injury and Osteoarthritis Outcome Score.

TABLE 2: Timed up and go test values (seconds) by age range.

Decade	N	Mean	SD
50-59	17	10.9	2.8
60-69	40	12.1	3.6
70-79	18	13.6	3.3
80-85	3	17.0	2.6
Total	78	12.4	3.5

SD: Standard deviation.

TABLE 3: Correlation between TUG test and clinical parameters.

Independent variable		TUG
Age (years)	r value	0.357
	p value	0.001
BMI (kg/m²)	r value	0.240
	p value	0.029
HADS-A	r value	0.302
	p value	0.006
HADS-D	r value	0.246
	p value	0.025
BBS score	r value	-0.379
	p value	0.000
KOOS-Symptoms	r value	-0.236
	p value	0.032
KOOS-Quality of life	r value	-0.229
	p value	0.037

Spearman correlation. TUG: Timed up and go; BMI: Body mass index; HADS-A: Hospital Anxiety and Depression Scale-Anxiety; HADS-D: Hospital Anxiety and Depression Scale-Depression; BBS: Berg Balance Scale; KOOS: Knee Injury and Osteoarthritis Outcome Score.

logistics regression analysis revealed that BBS was the most important predictor for the risk factors of abnormal TUG (Nagelkerke R^2=0.125; Hosmer-Lemeshow test p=0.440) (Table 4). According to this analysis, the decreased functional mobility risk was found to be higher in patients with balance impairment.

Power for the factors, such as age, BMI, HADS, BBS and KOOS, related with the low functional mobility level in women with symptomatic knee osteoarthritis varied between 65.1% and 96.6%. For age, the effect size was 0.357, power (1-β err prob) was 94.6%; for BMI, the effect size was 0.240, power (1-β err prob) was 68.8%; for HADS-A, the effect size was 0.302, power (1-β err prob) was 85.9%; for HADS-D, the effect size was 0.246, power (1-β err prob) was 70.8%; for BBS score, the effect size was 0.379, power (1-β err prob) was 96.6%; for KOOS symptoms, the effect size was 0.236, power (1-β err prob) was 67.5% and for KOOS QoL, the effect size was 0.229, power (1-β err prob) was 65.1%.

TABLE 4: Regression model for loss of functional mobility.

	B	SE	Wald	df	p value	Exp (B)	95% CI for EXP (B) Lower	Upper
BBS	-0.17	0.08	4.3	1	0.039	0.8	0.722	0.991
Constant	9.97	4.23	5.5	1	0.019	21450.8		

CI: Confidence interval; SE: Standard error; df: Degrees of freedom; BBS: Berg Balance Scale.

DISCUSSION

The present study investigates the factors related to functional mobility in women with symptomatic knee osteoarthritis. Functional mobility measured using the TUG test in women with knee osteoarthritis revealed a significant relationship between age, BMI, emotional state, balance, knee-related symptoms and QoL. Balance was detected as the determinant of mobility in the regression analysis.

In our study, the duration of TUG test was prolonged with ageing. The results of this study are consistent with that of the previous studies.[4,17-19] Knowing the reference values of the TUG test duration is useful to determine mobility disorders and related factors.[4] TUG test duration is longer in women >70 years of age living in the community.[18] In the same study, the mean age of the patients was 77.5±5.2 years and the mean TUG test time was 10.2±3.1 s. In addition, the mean time of TUG in women aged 71-80 years was 9.5-9.9 s, whereas in those aged 81-85 years, it was 11.2±3.6 s.[19] In another study, it has been reported that 92% of women aged 65-85 years completed the TUG test in <12 seconds.[20] In our study, the mean TUG test time in women with knee osteoarthritis was found to be longer than the healthy elderly people living in the society. In our study, BMI was associated with functional mobility in women with knee osteoarthritis. In a previous study, a significant correlation was found between TUG test time and body weight and height.[17,18]

An important finding of our study is that there was a significant relationship between functional mobility and both anxiety and depression. According to our

knowledge, the relationship between TUG and emotional state has not been previously investigated. However, there are some studies that have reported a relationship between slow walking and depression in the elderly people.[21,22]

Our study found a significant correlation between functional mobility and balance in women with knee osteoarthritis. In addition, it was found that balance impairment was determined to be responsible for extending the TUG test time. In a study of people 70 years of age living in the society, it was proposed that the TUG test and BBS scores were related.[23] In the same study, it was reported that balance impairment caused TUG test extension, especially the turning around part. Our results are consistent with those of previous studies.

In our study, there was a significant relationship between TUG test and symptoms and QoL of KOOS, indicating compatibility between performance-based tests and self-assessment scales. In previous studies on women with symptomatic knee osteoarthritis, it was suggested that mobility measured with TUG was significantly correlated with pain and QoL ($p<0.01$).[19,24] In another study, there was moderate correlation between TUG and all subscales of KOOS in patients with symptomatic knee osteoarthritis.[25]

Our study has some strengths and limitations. The strongest suit of our study is that all assessments were made by the same clinician. The second strength is that the validity and reliability studies of the Turkish versions of the KOOS, BBS and HADS scales are already in existence. However, our study has a lack of generalisability because it has been conducted in a single centre. The second limitation is that muscle strength and knee range of motion measurements were not evaluated. Another limitation is the inability to determine the cause-effect relationship between functional mobility and related factors due to its cross-sectional design.

CONCLUSION

Therefore, in our study, factors related with the impairment of functional mobility in women with knee osteoarthritis were ageing, being overweight, anxiety or depression, impaired balance and low KOOS symptoms and QoL scores. Balance training may be useful for increasing the functional mobility in patients with knee osteoarthritis.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

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