The relationship between fall risk and depression, anxiety and quality of life in patients with osteoporosis

Osteoporoz tanılı hastalarda düşme riskinin depresyon, anksiyete ve yaşam kalitesi ile ilişkisi

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Objective: In this study, in patients diagnosed with osteoporosis the relationship between fall risk and depression, anxiety and quality of life has been investigated.

Materials and Methods: This study included 100 women with and without osteoporosis. The Morse Fall Scale(MFS), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI) and European Osteoporosis Society Quality of Life Survey (QUALEFFO) scale were applied.

Results: The mean fall risk value was higher in patients with osteoporosis than in healthy controls and was statistically significant (p=0.005). In osteoporosis patients, there was a positive correlation all score (r=0.226, r=0.23, r=0.302, respectively).

Conclusion: As a result, patients with osteoporosis had an increased risk of falling, depression and anxiety levels. There was no correlation between the risk of falling and depression and anxiety levels, but it was observed that the quality of life worsened with the increased risk of falling.

Keywords: Anxiety, Depression, Fall risk, Osteoporosis, Quality of life.

Amaç: Bu çalışmada osteoporoz tanısı almış hastalarda düşme riski ile depresyon, anksiyete ve yaşam kalitesi arasındaki ilişki araştırılmıştır.

Gereç ve Yöntem: Çalışmaya osteoporozu olan ve olmayan 100 kadın dahil edildi. Morse Düşme Ölçeği (MFS), Beck Anksiyete Envanteri (BAI), Beck Depresyon Envanteri (BDI) ve Avrupa Osteoporoz Derneği Yaşam Kalitesi Anketi (QUALEFFO) ölçeği uygulandı.

Bulgular: Osteoporozlu hastalarda düşme riski değeri ortalaması sağlıklı kontrollere göre daha yüksekti ve istatistiksel olarak anlamlıydı (p=0,005). Osteoporozlu hastalarda tüm skorlar arasında pozitif korelasyon vardı (sırasıyla r=0,226, r=0,23, r=0,302).

Sonuç: Sonuç olarak osteoporozlu hastalarda düşme riski, depresyon ve anksiyete düzeyleri artmıştır. Düşme riski ile depresyon ve anksiyete düzeyleri arasında bir korelasyon bulunmamış ancak düşme riskinin artmasıyla yaşam kalitesinin kötüleştiği gözlenmiştir

Anahtar Kelimeler: Anksiyete, Depresyon, Düşme riski, Osteoporoz, Yaşam kaitesi.

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INTRODUCTION

Osteoporosis is a metabolic bone disease characterized by low bone mass and deterioration of the microarchitecture of bone tissue (Gür et al., 2004). One of the most important problems in osteoporosis is the increased risk of fractures, fractures due to low-energy traumas can lead to secondary health problems and even death. Morever, in terms of treatment and care, it burdens the caregiver ,the social security institutions and the economy of the countries as well as the individuals (Seeman et al., 1989).

Falls, a risk factor for osteoporotic fractures. After falls, vertebrae, hip and wrist fractures often occur in patients with osteoporosis (Dinçer at al., 2005; Yılmaz et al. 2005). In a study investigating the risk of falling in osteoporosis, it was reported that balance disorder may occur as a result of decreased lower extremity muscle strength due to osteoporosis and there may be an increased risk of falling (Sinaki et al., 2005) Another study showed that women in the same age group with osteoporosis were more likely to have falls and had poorer postural control than those without osteoporosis (Lynn et al., 2005).

Loss of mobility caused by osteoporotic fracture due to falls,difficulty in performing daily life activities due to pain,decreased functionality,and sense of uselessness cause social isolation (Goldt at al., 1996) .Therefore, in addition to pharmacotherapy, prevention of falls and reduction of fracture risk are the main components of osteoporosis treatment (Sinaki et al., 2005) There are a limited number of studies evaluating the risk of falling, depression, anxiety and quality of life in patients with osteoporosis. In a study, Lord et al.found that impaired cognitive status is risk factor for falls (Lord et al., 2005). In another study, they found that the risk of falling and the fear of falling negatively affected the quality of life (Suzuki et al.,2002).

Assessing the risk of falling and determining the impact of this risk on the patient's psychological state and daily life will enable patients to be more aware, reduce the risk of osteoporosis-related fractures, and develop new regulations and care approaches that will further improve the well-being and quality of life of patients. Psychosocial evaluation of the patient will increase the physician's awareness about the patient and help the treatment and follow-up of the patient.In our study, we aimed to evaluate the association between the risk of falling depression, anxiety, quality of life in patients diagnosed with osteoporosis.

MATERIALS AND METHODS

Our study, in which we planned to investigate the relationship between the risk of falling and depression, anxiety and quality of life in patients with osteoporosis, was planned as a prospective and case-control study. A total of 100 people, including 50 patients (patient group) and 50 healthy people (control group), who were followed up in the our hospital, were included in the study. Patients who presented to our polyclinic were classified into a patient group with a t-score of -2.5 or below according to Dual energy x-ray absorptiometry (DEXA) performed as part of a routine screening program, while t-scores above -1.0 were considered normal and included in the healthy volunteer group. Our work was planned in accordance with the Helsinki Declaration and approval was obtained from Ethics Committee. (Approval number: 2019/429). The study included participants over the age of 50 for both patients and healthy volunteers.

Inclusion Criteria for osteoporosis group

- Those over 50 years of age
- Those with a history of osteoporosis

Inclusion Criteria for healthy group

- Those over 50 years of age

Exclusion Criteria for both groups

- Those with concomitant comorbidities.
- Those with neurological diseases that increase the risk of falls (Parkinson's, dementia, etc.)

- Those with fibromyalgia.
- Those with low-energy osteoporotic fracture.
- Those with a history of psychiatric diseases and individuals using psychotropic agents

Information about the demographic data of the patients and controls included in the study were recorded.

Morse Fall Scale (MFS) was used for the fall risk of the patients in both groups, the Beck Depression Inventory (BDI) was used to evaluate the presence of depressive mood, the Beck Anxiety Inventory (BAI) was used to evaluate the presence of anxiety. In addition,the European Osteoporosis Society's Quality of Life Scale (QUALEFFO), which was developed specifically for osteoporosis,was used to evaluate the quality of life in the osteoporosis group.

Scales used in assessment

Morse fall scale (MFS)

The scale includes six criteria that define the risk of falling(presence of a history of falls, secondary diagnosis mobilization support, presence of intravenous route or heparin use, gait/transfer, and mental status).According to the criteria of this fall risk identification tool, a score of less than 25 points constitutes the low risk group for falling, a score between 25-50 constitutes the medium risk group for falling, and a score of 51 and above constitutes the high risk group for falling (Demir et al, 2012).

Beck Depression Inventory (BDI)

This inventory was measure the risk of depression, the level of symptoms, the variation in their severity. It contains twenty-one substances. There are 4 options in each item, and these options get a score of 0-3. By adding these scores the level of depression is calculated. Values of 0-9 indicate normal, 10-16 mild depression, 17-29 moderate depression, and 30-63 severe depression. High scores mean that the level of depression (Hisli et al, 1998).

Beck Anxiety Inventory (BAI)

It is a scale used to determine the frequency of anxiety symptoms experienced by people. It consists of 21 items. There are 4 options in each item, and these options get a score of 0-3. Values of 0- 7 indicate normal, 8- 15 mild anxiety, 16- 25 moderate anxiety, and 26- 23 severe anxiety. High scores mean that the level of anxiety (Beck et al., 1988).

European Osteoporosis Society Quality of Life Survey (QUALEFFO)

In our study, the QUALEFFO questionnaire was used to evaluate the quality of life. The QUALEFFO questionnaire is a repeatable scale that is frequently used in data evaluation and has been validated in many countries. It consists of 5 subscales that examine the five dimensions of health(pain, physical condition, mental health, social activity, general health assessment). High scores are associated with poor quality of life (Koçyiğit et al., 2003)

The validity and reliability of MFS, BDI, BAI and QUALEFFO scales have been made in our country (Demir et al., 2012; Hisli et al., 1998; Beck et al., 1988; Koçyiğit et al., 2003).

All scales were administered by an experienced clinician, and the results were evaluated by the same clinician. All evaluations were done in a single record.

Statistical analysis and ethical aspects

The strength of the study was obtained as 50.6±16.2 in the patient group and 35.3±15.3 in the control group for the QUALEFFO Scale, which is one of the quality of life scales used on these patients, in the article titled "Evaluation of Quality of Life in Postmenopausal Women with and without Osteoporosis using the QUALEFFO-41 Scale".For the QUALEFFO scale we used in our study, the minimum sample size required for the mean difference between these two groups to be statistically

significant with 5% type I error and 90% power was calculated as a minimum of 35 in each group.[15] In addition,it was taken into consideration that both non-parametric statistical methods could be applied and the study was a scale study.For this reason,it was determined that an average of 5 patients diagnosed with osteoporosis came to the outpatient clinic per month and a total of 50 patients were planned to be included in the study in 10 months until the end of the study.Thus,it was planned to work with a minimum of 100 individuals in total,with a minimum of 50 in the patient group and a minimum of 50 in the control group.

Normal distribution control of continuous data was performed by Shapiro Wilk test. Normally distributed variables are summarized with mean ± standard deviation values.Between osteoporosis and control groups;The differences between demographic, clinical and laboratory variables in numerical structure and MFS,BECK depression,BECK anxiety scores and QUALEFFO life score averages were compared with the Student's t test from parametric tests and the differences between the medians of these measurements were compared with the Mann Whitney U test, which is one of the nonparametric tests.The differences between the medians of more than two independent groups were compared with the Kruskal-Wallis test,which is one of the nonparametric tests.The relationships between categorical demographic and clinical variables,MFS, BECK depression, BECK anxiety score categories,and the relationships between all categorical variables were examined by Chi-Square analysis. The relationships between the two numerical variables were examined by correlation analysis and the Spearman rho correlation was used. The relationships between two numerical variables are visualized with scatter graphs.

Data analysis was performed using the Statistica v.13.3.1 program and a p value less than 0.05 was accepted statistically significant.

RESULTS

The study included 100 postmenopausal female patients, 50 of whom had osteoporosis (patient group) and 50 of whom did not have osteoporosis (control group). The ages of the all participants ranged from 50 to 75 years, and the median age of the patient group was statistically significantly higher than the control group (64.5 years, 58 years, p= 0.001, respectively). There was no statistically significant difference between the groups in terms of height, weight, Body Mass Index (BMI) (p = 0.37, p = 0.71, p= 0.42, respectively) (Table 1).

Table 1. Demographic data of the patient and control group

	Osteoporosis	Control	p
Age (years)	64.5	58	0.001[a]
Height (metre)	1.6	1.6	0.37 a
Weight (Mean±SS) (kg)	77.06±10.62	76.28±10.29	0.71 b
Body Mass Index (Mean±SS)(kg/cm2)	30.72±4.48	30.02±4.06	0.42 b

a: Mann Whitney u test, p: Student t test

When the groups were compared in terms of fall risk, the risk of falling was higher in the patient group and it was statistically significant (p <0.05) (Table 2). When the patient and the control group were compared in terms of depression and anxiety levels, BDI and BDI scores were found to be higher in the patient group and were statistically significant (p <0.05) (Table 2).

Table 2. Comparison of MFS, BECK Depression and BECK Anxiety scores of the groups

	Osteoporosis Median (min-max)	Control Median (min-max)	p*
Morse Fall score	40 (15-110)	35 (15-85)	0.005

BECK depression score	17(3-39)	14 (5-33)	0.006
BECK anxiety score	17(3-45)	10 (0-30)	0.001

When the categorical distribution of the fall risk, depression and anxiety levels of the groups was compared; The patient group with a severe MFS score (30%) was statistically significantly higher than the control group (12%) (p <0,05). There was no statistically significant difference between the patient and control groups in patients with moderate and mild MFS scores (Table 3). There was no significant difference in BDI score levels between the patient and control groups (p> 0.05) (Table 3). When we look at the anxiety levels, there is a statistically significant relationship between the groups (p <0.05). The proportion of patients with normal BAI score levels (8%) is lower than the proportion of controls (30%). There was no statistically significant difference between the proportions of patients and controls with other anx iety levels (Table 3).

Table 3. Categorical distribition of MFS, Beck Depression and Beck Anxiety scores of the groups

	Osteoporosis	**Control**	**p***
Morse Fall Scale n/%	11/22		
Mild Risk 0-24	24/48	20/40	**0.04**
	15/30		
Moderate Risk 25-50		24/48	
Severe Risk ≥51		**6/12**	
BECK Depression Score n/%	5/10		
	14/28	10/20	
Normal	22/44		0.07
Mild	8/18		
Depression		21/42	
Moderate Depression		16/32	
Severe Depression 30- 63		3/6	
BECK Anxiety Score n/%	**4/8**		
	17/34	15/30	
Normal 0- 7	20/40		**0.01**
Mild Anxiety 8-15	9/18	18/36	
Moderate Anxiety 16-25		14/28	
Severe Anxiety 26-23		3/6	

p*: Ki-kare texts

The mean QUALEFFO total score of the patients was 48.9± 15.2 in patients diagnosed with osteoporosis. When the subgroup parameters of the QUALEFFO quality of life scale were evaluated one by one, the results are given in Table 4.

Table 4. Quality of life scores in patients diagnosed with osteoporosis

QUALEFFO scores	**Mean ± SS**
Pain	40.5±26.62
Physical function	47.18±21.6
Social activity	58.4±21.2
General health	57.1±15.01
Mental function	47.7±12.17
QUALEFFO Total	48.9±15.18

*Parameters that do not meet the assumption of normality

In the analysis conducted to evaluate the relationship between the fall risk, depression, anxiety levels and demographic data of the groups, a moderate statistically significant positive correlation was found between the risk of falling and age in the osteoporosis group. There was a weak negative correlation between the risk of falling and weight (p< 0.05) (Table 5).There was no significant relationship

between the depression and anxiety levels of the groups and height, weight, age and BMI (p> 0.05) (Table 5).

Table 5. Relationship between Beck Depression, Beck Anxiety and MFS score and demographic data

	Age	Height	Weight	BMI
Osteoporosis				
Beck depression score	r=0.12 p=0.41	r=-0.02 p=0.9	r=-0.12 p=0.41	r=-0.11 p=0.45
Beck anxiety score	r=0.01 p=0.95	r=-0.1 p=0.49	r=0.11 p=0.43	r=0.16 p=0.26
MFS score	**r=0.48 p <0.001**	r=0.02 p=0.89	**r=-0.3 p=0.04**	r=-0.25 p=0.08
Control				
Beck depression score	r=0.06 p=0.66	r=0.03 p=0.86	r=0.03 p=0.84	r=0.02 p=0.88
Beck anxiety score	r=-0.08 p=0.58	r=-0.02 p=0.91	r=0.2 p=0.18	r=0.25 p=0.08
MFS score	r=0.12 p=0.42	r=-0.17 p=0.24	r=0.03 p=0.85	r=0.18 p=0.21

r: Sperman rho correlation coefficient

When the relationships between the fall risk and depression and anxiety were evaluated, no statistically significant correlation was found (p>0.05) (Table 6).

Table 6. Relationship between MFS and Beck Depression and Beck Anxiety Score

Correlation	**Beck Depression Score**	**Beck Anxiety Score**
Osteoporosis-MFS score	r=0.28 p=0.053	r=0.14 p=0.33
Control- MFS score	r=0.21 p=0.13	r=0.24 p=0.1

r: Sperman rho correlation coefficient

When the effect of fall risk, depression and anxiety on quality of life in osteoporosis patients was examined, a statistically significant positive linear relationship was found between MFS, Beck Depression and Beck Anxiety score and QUALEFFO Total score (p<0.05) (Figure 1-3).

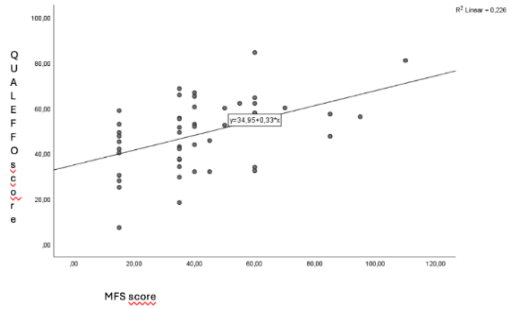

Figure 1. Relationship between MFS and QUALEFFO score

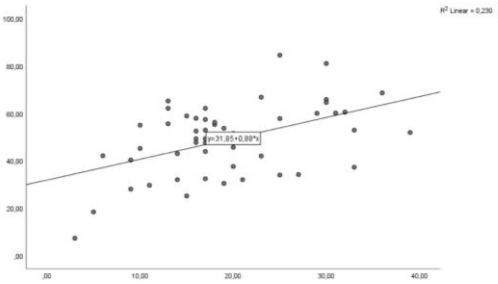

Figure 2. The relationship between BDI and QUALEFFO score

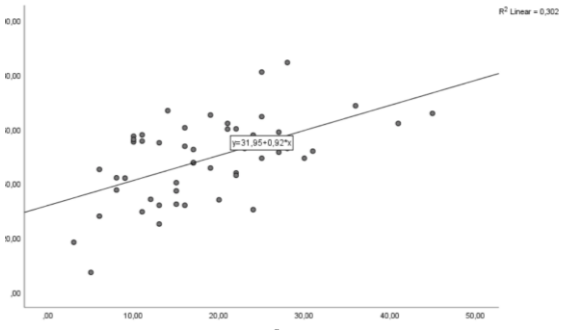

Figure 3. Relationship between BAI and QUALEFFO score

When the relationship between quality of life and clinical features in osteoporosis patients was examined; There was no statistically significant correlation between QUALEFFO total score and subgroup scales and BMI level (p> 0.05) (Table 7). Only a moderate statistically significant positive correlation was found between age and physical function score and a weak correlation between age and total quality of life score. (respectively, r= 0.43, p= 0.002; r= 0.33, p= 0.001).

Table 7. The relationship between the subparameters of the QUALEFFO quality of life scale and clinical features

Osteoporosis QUALEFFO	**Age**	**BMI**
Pain	r=-0.004 p=0.97	r=0.22 p=0.13
Physical function	**r=0.43** **p=0.002**	r=0.01 p=1
Social activity	r=0.2 p=0.15	r=0.13 p=0.38
General health	r=0.18 p=0.2	r=-0.1 p=0.51
Mental function	r=0.02 p=0.88	r=-0.23 p=0.12
QUALEFFO Total	**r=0.33** **p=0.01**	r=0.05 p=0.71

r: Spearman rho correlation coefficient

DISCUSSION

Osteoporosis is a metabolic disease that causes a decrease in bone mass density and an increase in the risk of bone fragility (Gür et al., 2004). Falls are the most important risk factor for fractures in people with osteoporosis (Morrison et al., 2012). Fracture formation secondary to falling is an important health problem due to the economic burden that countries place on social security institutions, in addition to the high risk of mortality and morbidity (Ip et al. 2010; Gillespie et al., 2008).

Intrinsic factors that increase the risk of falling include being of the female gender, advanced age, vestibular, visual, cognitive disorders, balance, muscle strength, inadequacy in activities of daily living, depression, osteoarticular disease, diabetes, vitamin D deficiency and drug use. It has been reported that patients with osteoporosis have an increased risk of balance disorder and falling due to decreased lower extremity muscle strength (Sinaki et al., 2005).

Ünlüsoy et al. noted that women with osteoporosis in the same age group were more prone to falls and had worse postural control than those without osteoporosis (Ünlüsoy et al.,2011). In our study, it was suggested that the risk of falling was higher in the osteoporosis group. Our findings support the theory that osteoporosis increases the risk of falls by producing changes in body balance, posture and muscle strength.

In our study, when the relationship between the risk of falling and the demographic data of the patients participating in the study was evaluated a positive correlation was observed between the risk of falling and age in patient group. This supports the susceptibility to fall due to the increasing destructive effect of osteoporosis on the bone with advancing age, changes in posture and loss of balance. In addition it was observed that there was a negative correlation between weight and the risk of falling in the patient group. This finding can be explained by the fact that it may cause a decrease in the risk of falling as a result of decreased physical activity and restriction of mobilization in patients due to weight gain.

Falls are caused by personal and environmental factors and lead to many consequences, both physical and psychological (Lawhorne et al.2008; Rubenstein et al. 2006) . Depression is a risk factor for both osteoporosis and fall (Onat et al., 2013 ; Haney et al., 2008). Depressed individuals have low levels of physical activity, less exposure to sunlight,and malnutrition,as well as high levels of cortisol that lead to an increase in bone reabsorption,and proinflammatory cytokines are among the causes of osteoporosis (Haney et al.,2008) . In a study, Michelson et al. found that there is a positive relationship between osteoporosis and depression. In another study, Bianchi et al. found that 40% of osteoporosis patients had depressive symptoms. In our study, depression scores were found to be higher in the patient group with osteoporosis compared to the control group. Our findings were consistent with the literature. Likewise, when we compared the anxiety scores of the osteoporosis and control groups, the BAI score was significantly higher in the patient group with osteoporosis. When we look at the literatüre, in a study conducted in Norwegian women, anxiety rates were found to be higher in patients

due to osteoporosis and fractures compared to healthy controls.

Lord et al. found that impaired cognitive status was an important risk factor for falls, but psychoactive substance use was not significantly associated with falls. Another study showed that depression increases the risk of subsequent falls in women by 40%.In addition, it has been observed that depression leads to physical regression in people (Pearce et al.,2022). Van Den Berg et al. reported that the presence of depression after low-energy fracture over the age of 60 was a risk factor for falls that may develop for 2 years. In our cross-sectional study, in which we evaluated the relationship between fall risk and depression, there was no significant relationship between fall risk and depression scores. Our results were not consistent with similar studies in the literature. It was thought that the most important reason for this incompatibility could be due to the difference between the criteria for inclusion in the study groups. Unlike other previous studies, patients with a history of fracture were not included in our study. A possible relationship between fracture history and depression in patients that may affect our findings has not been evaluated.

After falls, fear of falling and post-fall anxiety syndrome may develop. This may cause a decrease in the individual's sense of self-confidence,avoidance of physical activity,a more sedentary life,and in the long run,it may lead to poor condition,weakness,abnormal gait, and increase the risk of falling (Rubenstein et al., 2006). In line with this information, the relationship between fall risk and anxiety was also evaluated in our study,there was no significant relationship between fall risk and anxiety.

Assessment of quality of life in osteoporosis contributes to the creation of the most effective treatment option,to increase the physician's communication with the patient,and to reveal the physical or psychosocial problems that are overlooked.In our study,the quality of life of osteoporosis patients was evaluated, and their relationships with age ans BMI were also examined in order to determine the factors affecting the quality of life.A negative relationship was found between advancing age and quality of life.Oleksik et al.showed that advancing age has a negative effect on quality of life in patients with osteoporosis,especially since it increases the prevalence of vertebral fractures). Low BMI is a risk factor for developing osteoporosis. When we look at the studies evaluating the effect of BMI on quality of life, Adıgüzel et al. did not find a relationship between BMI and quality of life in their study in 130 postmenopausal women). Similarly, in our study, there was no relationship between the BMI of the patients and the quality of life.

In our study, we also examined the effect of fall risk, depression and anxiety on quality of life in patients diagnosed with osteoporosis. A positive linear relationship was found between quality of life and the risk of falling, depression and anxiety scores. When we look at the studies examining the relationship between depression and quality of life in the literature, Hartman et al. found that the emotional and social subgroup scores of SF 36 in premenopausal women. They found that depression in osteoporosis reduced quality of life, with a lower rate than controls (Hartman et al., 2006) Cumming et al.showed that a positive significant correlation between the BDI score they used to evaluate depression and the subparameter scores of the QUALEFFO quality of life scale. In our study, it was determined that as the depression scores increased in osteoporosis patients, the QUALLEFFO scores increased so the quality of life decreased. In addition, it was observed that quality of life scores increased with the increase in anxiety scores. These findings were found to be consistent with the literature.

Limitations

Our study was conducted in a single center and in a small patient population; the shortcomings of our study are that the socioeconomic status, personal characteristics and physical activitiy levels of the patients, which will affect their mood and quality of life, are not evaluated. In addition, the age difference between the patient

and control groups in our study is among the limitations of our study. More precise results will be obtained with prospective, multicenter studies involving larger patient groups.

CONCLUSION

In our study, there was an increase in the risk of falling, depression and anxiety levels in patients diagnosed with osteoporosis, and no relationship could be established between the risk of falling and depression and anxiety levels, but it was determined that the quality of life deteriorated with the increase in the risk of falling.

For this reason, we believe that the measures to be taken to determine the fall and risk factors, to reduce falls, which are the most frightening complication of osteoporosis. In addition, we think that the cost of health care will be reduced.

Authorship Contributions: UH, PMS, GŞ collected the data and wrote the main manuscript. UH, MTS, OG analyzed and interpreted the patient data. PMS, OG, GŞ designed the work and substantively revised the article. All authors read and approved the final manuscript.

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Conflict of interest: The authors have no conflicts of interest to declare.

Ethics approval and consent to participate: Ethical approval for this study was obtained from Mersin University clinical research ethics committee on 02.10.2019 Decision number: 2019/429

The study was conducted in line with the principles of the "Helsinki Declaration."

Availability of Data and Materials: The datasets from the current study can be obtained on request from the corresponding author.

REFERENCES

Adıgüzel, D., Gündüz, H. O., Bodur, H., & Yücel, M. (2000). Quality of life in osteoporosis. *Romatizma, 15*, 173–179.

Beck, A. T., Epstein, N., Brown, G., & Ster, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56*(6), 893–897.

Bianchi, M. L., Orsini, M. R., Saraifoger, S., Ortolani, S., Radaelli, G., & Betti, S. (2005). Quality of life in post-menopausal osteoporosis. *Health and Quality of Life Outcomes, 3*, 78. https://doi.org/10.1186/1477-7525-3-78

Cumming, R. G., Salkeld, G., Thomas, M., & Szonyi, G. (2000). Prospective study of the impact of fear of falling on activities of daily living, SF-36 score, and nursing home admission. *Journal of Gerontology: Series A, 55*(5), M299–M305. https://doi.org/10.1093/gerona/55.5.m299

Demir, N. Y., & İntepeler, Ş. S. (2012). Morse düşme ölçeğinin Türkçeye uyarlanması ve duyarlılık-seçicilik düzeyinin belirlenmesi. *Ege Üniversitesi Hemşirelik Fakültesi Dergisi*, *28*(1), 57–71.

Dinçer, D. (2005). Osteoporoza bağlı kırıklar ve cerrahi tedavi yaklaşımları. In Y. Gökçe-Kutsal (Ed.), *Osteoporoz* (pp. 293–314). Güneş Kitabevi.

Falch, J. A., Bentzen, H., & Dahl, A. A. (2003). Pain, functional level and emotional problems of women with osteoporosis and vertebral fractures. *Tidsskrift for den Norske Laegeforening, 123*, 3355–3357.

Gillespie, L. D., Robertson, M. C., & Gillespie, W. J. (2009). Interventions for preventing falls in older people living in the community. *Cochrane Database of Systematic Reviews, CD007146.*

Gold, D. T. (1996). The clinical impact of vertebral fractures: Quality of life in women with osteoporosis. *Bone, 18*(Suppl. 3), 185–189. https://doi.org/10.1016/8756-3282(95)00500-5

Gür, S. (2004). Kemik kalitesi ve kırık ilişkisi. In Y. Gökçe-Kutsal (Ed.), *Osteoporozda kemik kalitesi* (pp. 235–254). Güneş Kitabevi.

Haney, E. M., & Warden, S. J. (2008). Skeletal effects of serotonin (5-hydroxytryptamine) transporter inhibition: Evidence from clinical studies. *Journal of Musculoskeletal and Neuronal Interactions, 8*(2), 133–145.

Hartman, J. M., Berger, A., & Baker, K. (2006). Quality of life and pain in premenopausal women with major depressive disorder: The POWER Study. *Health and Quality of Life Outcomes, 4*, 2. https://doi.org/10.1186/1477-7525-4-2

Hisli, N. (1988). Beck depresyon envanterinin geçerliği üzerine bir çalışma. *Psikoloji Dergisi, 6*, 118–126.

Ip, T. P., Leung, J., & Kung, A. W. (2010). Management of osteoporosis in patients hospitalized for hip fractures. *Osteoporosis International, 21*(Suppl. 6), S605–S614. https://doi.org/10.1007/s00198-010-1398-8

Kocyigit, H., Gülseren, Ş., Erol, A., Hizli, N., & Memis, A. (2003). The reliability and validity of the Turkish version of QUALEFFO. *Clinical Rheumatology, 22*(1), 18–23. https://doi.org/10.1007/s10067-002-0653-6

Lawhorne, L. W., Ouslander, J. G., Parmelee, P. A., Resnick, B., & Calabrese, B. (2008). Urinary incontinence: A neglected geriatric syndrome in nursing facilities. *Journal of the American Medical Directors Association, 9*, 29–35. https://doi.org/10.1016/j.jamda.2007.08.003

Lord, S. R., Clark, R. D., & Webster, I. W. (1991). Physiological factors associated with falls in an elderly population. *Journal of the American Geriatrics Society, 39*(12), 1194–1200. https://doi.org/10.1111/j.1532-5415.1991.tb03574.x

Lynn, S. G., Sinaki, M., & Westerlind, K. C. (1997). Balance characteristics of persons with

osteoporosis. *Archives of Physical Medicine and Rehabilitation, 78*(3), 273–277. https://doi.org/10.1016/S0003-9993(97)90033-2

Michelson, D., Stratakis, C., Hill, L., et al. (1996). Bone mineral density in women with depression. *The New England Journal of Medicine, 335*, 1176–1181. https://doi.org/10.1056/NEJM199610173351602

Oleksik, A., Lips, P., & Dawson, A. (2000). Health-related quality of life in postmenopausal women with low BMD with or without prevalent vertebral fractures. *Journal of Bone and Mineral Research, 15*, 1384–1392. https://doi.org/10.1359/jbmr.2000.15.7.1384

Pamuk, G., Kutlu, R., & Civi, S. (2014). Evaluation of quality of life in postmenopausal women with and without osteoporosis using the QUALEFFO-41 Scale. *Türkiye Fiziksel Tıp ve Rehabilitasyon Dergisi, 60*, 139–146. https://doi.org/10.5152/tftrd.2014.47855

Pearce, M., Garcia, L., Abbas, A., Strain, T., Schuch, F. B., Golubic, R., Kelly, P., Khan, S., Utukuri, M., Laird, Y., Mok, A., Smith, A., Tainio, M., Brage, S., & Woodcock, J. (2022). Association Between Physical Activity and Risk of Depression: A Systematic Review and Meta-analysis. *JAMA psychiatry*, *79*(6), 550–559. https://doi.org/10.1001/jamapsychiatry.2022.0609

Rubenstein, L. Z. (2006). Falls in older people: Epidemiology, risk factors and strategies for prevention. *Age and Ageing, 35*(Suppl. 2), ii37–ii41. https://doi.org/10.1093/ageing/afl084

Seeman, E., & Allen, T. (1989). Risk factors for osteoporosis. *Australian and New Zealand Journal of Medicine, 19*, 69–75.

Sinaki, M. (2004). Falls, fractures and hip pads. *Current Osteoporosis Reports, 2*, 131–137. https://doi.org/10.1007/s11914-996-0012-7

Sinaki, M., Brey, R. H., Hughes, C. A., Larson, D. R., & Kaufman, K. R. (2005). Balance disorder and increased risk of falls in osteoporosis and kyphosis: Significance of kyphotic posture and muscle strength. *Osteoporosis International, 16*, 1004–1010. https://doi.org/10.1007/s00198-004-1791-2

Suzuki, M., Ohyama, N., Yamada, K., & Kanamori, M. (2002). The relationship between fear of falling, activities of daily living and quality of life among elderly individuals. *Nursing and Health Sciences, 4*(4),155-161. https://doi.org/10.1046/j.1442-2018.2002.00123.x

Şahin Onat, Ş., Delialioğlu, S. Ü., Biçer, S., & Özel, S. . (2013). Depression in Osteoporosis and Effects on Quality of Life. Turkish Journal of Osteoporosis, 19(3), 0-0. https://doi.org/10.4274/tod.25238

Tegin, B. (1980). *Depresyonda bilişsel şemalar* (Yayımlanmamış doktora tezi). Hacettepe Üniversitesi, Ankara.

Ünlüsoy, D. Aydoğ, E., Tuncay,R., Eryüksel, R. Ünlüsoy, İ.Çakcı, A. Türk Osteoporoz Dergisi 2011;17:37-43.

Van den Berg, M., Verdijk, N. A., Leusink, G. L., Wijnands-van Gent, C. J., Romeijnders, A. C., & Pop, V. J. (2011). Depression after low-energy fracture in older women predicts future falls: A prospective observational study. *BMC Geriatrics, 11*, 73. https://doi.org/10.1186/1471-2318-11-73

Yılmaz, F. (2005). Effect of vertebral fracture on quality of life. *Osteoporoz Dünyasından, 11*(3), 105–110. https://doi.org/10.4274/tod.96158

Whooley, M. A. (1999). Depression, falls, and risk of fracture in older women. *Archives of Internal Medicine, 159*(5), 484. https://doi.org/10.1001/archinte.159.5.484