doi: 10.53446/actamednicomedia.1224138

Acta Medica Nicomedia

Cilt: 6 Sayı: 2 Haziran 2023 / Vol: 6 Issue: 2 June 2023
https://dergipark.org.tr/tr/pub/actamednicomedia

Research Article | Araştırma Makalesi

CLINICAL AND DEMOGRAPHIC CHARACTERISTICS OF OUR OSTEOPOROSIS PATIENTS WITH FRAGILITY FRACTURES

FRAJİLİTE KIRIKLI OSTEOPOROZLU HASTALARIMIZIN KLİNİK VE DEMOGRAFİK ÖZELLİKLERİ

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ABSTRACT

Objective: Due to the high recurrence risk and mortality rate in fragility fractures, we aimed to investigate the characteristics of individuals with fragility fractures evaluated in our clinic.

Methods: The files of male and postmenopausal female patients over the age of 50 who had a fragility fracture of the vertebra, forearm, proximal humerus and hip in the last 2 years were reviewed retrospectively.

Results: Of the 121 patients, 86 (71.1%) were female, 35 (28.9%) were male, and the mean age of the patients was 68.49±9.85. The fracture site was hip in 36 (29.8%) patients, forearm in 35 (28.9%) patients, and vertebra in 26 (21.5%) patients; multiple fractures were present in 21 (17.4%) patients. While 25 (20.6%) patients had a previous fragility fracture. 22 (18.2%) patients had adequate dietary calcium, 47 (38.8%) had adequate dietary protein intake. The parents of 16 (13.2%) patients had hip fractures. 52 (43%) of the patients had comorbidity that increased the risk of osteoporosis, and 62 (51.2%) had drug use that increased the risk of osteoporosis. 92 (76%) patients were not receiving any osteoporosis treatment at the time of fracture, and 5 (4.1%) patients developed fractures while under medical treatment. The median 25(OH)VitD3 of the patients was 16.5 µg/L (3.0/156.0). In bone mineral density evaluations, the median of the femoral neck T score was -1.5 (-4.2/2.2), the median of the femoral total T score was -1.0 (-4.1/0.90), and the median of the lumbar total T score was -2.2 (-4.3/2.6).

Conclusion: Knowing the factors associated with fragility fractures will facilitate the identification of high-risk individuals and will also provide an idea in terms of preventive measures and systematic approaches to be taken.

Keywords: Clinical features, demographic data, fragility fracture, osteoporosis

ÖZ

Amaç: Frajilite kırıklarındaki yüksek tekrarlama riski ve mortalite oranı nedeniyle, çalışmamızda kliniğimizde değerlendirilen frajilite kırıklı bireylerin özelliklerini araştırmayı amaçladık.

Yöntem: Son 2 yıl içerisinde vertebra, ön kol, proksimal humerus ve kalçasında frajilite kırığı olan 50 yaş üstündeki erkek ve postmenapozal kadın hastaların dosyaları retrospektif olarak incelendi.

Bulgular: 121 hastanın 86'sı (%71,1) kadın, 35'i (%28,9) erkekti ve hastaların yaş ortalaması 68,49±9,85 idi. Hastaların 36'sının (%29,8) kırık yeri kalça, 35'inin (%28,9) ön kol, 26'sının (%21,5) vertebra, 21'inin (%17,4) proksimal humerusken; 3 (%2,5) hastada multiple kırık mevcuttu. 25 (%20,6) hastada daha önce geçirilmiş frajilite kırığı vardı 22 (%18,2) hastada diyette yeterli kalsiyum, 47 (%38,8) hastada diyette yeterli protein alımı mevcuttu. 16 (%13,2) hastanın ebeveyninde kalça kırığı vardı. Hastaların 52 (%43)'sinde osteoporoz riskini artıran komorbidite, 62 (%51,2)'sinde osteoporoz riskini artıran ilaç kullanımı vardı. 92 (%76) hasta kırık sırasında herhangi bir osteoporoz tedavisi almamaktaydı, 5 (%4,1) hastada ise medikal tedavi altındayken kırık gelişmişti. Hastaların 25(OH)VitD3 ortancası 16,5 µg/L (3,0/156,0) idi. Kemik mineral yoğunluğu değerlendirmelerinde femur boyun T skoru ortancası -1,5 (-4,2/2,2), femur total T skoru ortancası -1,0 (-4,1/0,90), lomber total T skoru ortancası -2,2 (-4,3/2,6) idi.

Sonuç: Frajilite kırıkları ile ilişkili faktörlerin bilinmesi yüksek riskli kişilerin belirlenebilmesini kolaylaştıracak, alınacak koruyucu önlemler ve sistematik yaklaşımlar açısından da fikir verecektir.

Anahtar Kelimeler: Klinik özellikler, demografik veriler, frajilite kırığı, osteoporoz

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Başvuru/Submitted: 01.01.2023 • **Kabul/Accepted:** 24.05.2023 • **Online Yayın/Published Online:** 30.06.2013

Introduction

Osteoporosis is the most common chronic bone disease, resulting in an increased risk of fracture as a result of low bone mass and deterioration of the microarchitecture of bone tissue.[1]

Fragility fractures occur spontaneously or occur after low-energy trauma (such as coughing, sneezing, or falling from a height that does not exceed one's own height) that would not normally result in a fracture of healthy bone. It is estimated that one out of every three women and one in every five men will have a fragility fracture after the age of 50.[2-4]

Osteoporosis and its complications, especially hip fractures, create a physical, psychological, social and economic burden.[5] According to the results of the large population-based FRACTURK study conducted in 12 centers, it is estimated that the number of hip fracture cases in Turkey will reach 64000 in 2035.[6] In a systematic review, it was determined that there was an 8-36% increase in mortality in the first year after hip fracture, and it was also emphasized that mortality in men was higher than in women in the same review.[7]

While the risk of having a new fracture increases two to three times in those with a fracture, it is observed that 23% of women over 50 years of age develop a secondary fracture within one year after the first fracture.[2,3] It has been reported that 50% of recurrent fractures can be prevented and mortality is reduced with appropriate treatment.[8,9] Despite this, only 20% of women with fragility fractures were found to receive osteoporosis treatment.[10] Therefore, knowing the risk factors for fractures is very important in terms of guiding the patient by taking precautionary measures.

In this study, we aimed to investigate the demographic and clinical characteristics of individuals with fragility fracture who applied to our outpatient clinic and to reveal the risk factors associated with fracture.

Methods

In this study, patients with fragility fractures who applied to the Physical Medicine and Rehabilitation Clinic of our hospital between October 2021 and July 2022 were included. The files of the patients were reviewed retrospectively. Before the study, the approval of our hospital's Ethics Committee dated 06.06.2022 and numbered 139/29 was obtained, and our study was conducted in accordance with the principles of the Declaration of Helsinki.

Our study included those with fragility fractures in the vertebra, forearm, proximal humerus and hip, among male and postmenopausal female patients over 50 years old who had a fragility fracture in the last 2 years. Pathological fractures (such as osteogenesis imperfecta, osteomalasia, Paget's, bone tumor, multiple myeloma) were not included in our study.

121 patients who met the study criteria and had complete file data were included in our study.

Demographic data of all patients (age, gender, education and working status, marital status, body mass index (BMI)), comorbidities, diseases and drugs that may cause secondary osteoporosis, fracture site, previous fragility fracture history and location, detailed osteoporosis treatment histories, smoking, alcohol use, dietary calcium, protein, caffeine intake, adequate physical activity, menopausal age for women, presence of hip fracture in the mother or father, and the number of falls in the last year were noted. Among the latest bone mineral density (BMD) values, lumbar total T score, lumbar total BMD (gr/cm2), femur total T score, femur neck T score, femur total BMD (gr/cm2) and 25(OH)VitD3, calcium, phosphorus, alkaline phosphatase (ALP), parathormone (PTH) levels were recorded from their files.

SPSS version 28.0 was used for statistical analysis. The suitability of the data to the normal distribution was evaluated by visual and analytical methods (Kolmogrov-Smirnov test). Categorical data were presented as n (%), non-normally distributed numerical data and ordinal data were presented as median (min-max), and normally distributed numerical data as mean±SD.

Results

Of the 121 patients included in the study, 86 (71.1%) were female, 35 (28.9%) were male, and the mean age of the patients was 68.49±9.85. The demographic data of the patients are presented in Table 1, and the risk factors associated with fracture are presented in Table 2.

Table 1. Demographic Data of Patients (n=121)

Age, mean (SS)		68.49 (9.85)
BMI, mean (SS)		29.23 (5.7)
Gender, n (%)	Woman	86 (71.1)
	Man	35 (28.9)
Educational status, n (%)	İlleterate	29 (24.0)
	Literate	10 (8.2)
	0-5 years	44 (36.4)
	5-8 years	10 (8.3)
	8-12 years	17 (14.0)
	≥12 years	11 (9.1)
Working status, n (%)	Unemployed	111(91.7)
	Employed	10 (8.3)
Marital status, n (%)	Married	80 (66.1)
	Single	2 (1.7)
	Other	39 (32.2)
Living place, n (%)	City center	107 (88.4)
	Village	14 (11.6)
Living condition, n (%)	With spouse or children	106 (87.6)
	Alone	13 (10.7)
	Other	2 (1.7)

SS: Standard deviation, BMI: Body mass index

Table 2. Risk Factors for Fracture (n=121)

Alcohol consumption, n (%)	No	119 (98.3)
	Yes	2 (1.7)
Somking, n (%)	No	98 (81.0)
	Yes	23 (19.0)
Daily caffee consumption, n (%)	<4 cups/day	119 (98.3)
	≥4 cups/day	2 (1.7)
Dietary calcium intake, n (%)	Inadequate	99 (81.8)
	Adequate*	22 (18.2)
Dietary protein intake, n (%)	<1 g/kg/day protein	74 (61.2)
	≥1 g/kg/day protein	47 (38.8)
Physical activity, n (%)	Inadequate	91 (75.2)
	Adequate**	30 (24.8)
Age of menopause, mean (SS)		45.45
Parental history of hip fracture, n (%)	No	105 (86.8)
	Yes	16 (13.2)
Number of falls in the last year, median (min-max)		1 (0-25)
Comorbidity that can lead to OP, n (%)	No	69 (57.0)
	Yes***	52 (43.0)
Drug that can lead to OP, n (%)	No	59 (48.8)
	Yes****	62 (51.2)

SS: Standard deviation, OP: Osteoporosis, *The calculation system recommended by the International Osteoporosis Foundation was used (http://www.iofbonehealth.org/calcium-calculator), **People who do at least 3 days a week and at least 30 minutes at a time by walking, cycling, resistive exercise ***Diabetes Mellitus, rheumatic diseases, celiac disease, inflammatory bowel disease, kidney or liver disease, immunodeficiency, hypogonadism, hyperthyroidism, hyperparathyroidism ****Proton pump inhibitors, glucocorticoids, antiepileptics, thyroid hormone drugs, immunosuppressives, antineoplastics, anticoagulants

The fracture site was hip in 36 (29.8%) patients, forearm in 35 (28.9%) patients, and vertebra in 26 (21.5%) patients; multiple fractures were present in 21 (17.4%) patients. While 96 (79.4) patients did not have a history of previous fragility fracture, 25 (20.6%) patients did. The first fracture site of patients with previous fragility fractures was hip in 9 (36%) patients, forearm in 9 (36%), proximal humerus in 4 (16%), and vertebra in 3 (12%) patients. The secondary fracture site was hip in 8 (32%) patients, forearm in 5 (20%), proximal humerus in 4 (16%), vertebra in 3 (12%), and ankle and tibia in 5 (20%) patients. 92 (76%) patients were not receiving any osteoporosis treatment at the time of fracture, 8 (6.6%) patients had previously used calcium or vitamin D but stopped, 6 (5.0%) patients developed fractures while using calcium or vitamin D, 10 (% 8.3) patients had previously used bisphosphonates for various periods (3 months-5 years) and stopped. Fractures developed in 5 (4.1%) patients while under osteoporosis treatment (1 patient using alendronic acid, 1 patient using ibandronic acid, 1 patient using zolendronic acid, and 2 patients using denosumab). Current fracture-related features are presented in Table 3, laboratory data in Table 4, and BMD-related data in Table 5.

Table 3. Clinical Features Associated with Existing Fracture (n=121)

Fracture site, n (%)	**Hip**	36 (29.8)
	Forearm	35 (28.9)
	Vertebrae	26 (21.5)
	Proximal humerus	21 (17.4)
	Multiple	3 (2.5)
Previous fragility fracture history, n (%)	**None**	96 (79.4)
	Hip	5 (4.1)
	Forearm	5 (4.1)
	Proximal humrerus	4 (3.3)
	Vertebrae	3 (2.5)
	Pelvis	1 (0.8)
	Others	5 (4.1)
	Multiple	2 (1.7)
OP treatment history, n (%)	**None**	92 (76)
	Has stopped using calcium or Vitamin D	8 (6.6)
	Have suffered a fragility fracture while using Calcium or Vitamin D	6 (5.0)
	Has stopped using bisphosphonate/ denosumab/ teriparatide	10 (8.3)
	Have suffered a fragility fracture while using isphosphonate/denosumab/teriparatide	5 (4.1)

OP: Osteoporosis

Table 4. Laboratory Data of Patients (n=121)

25(OH)VitD3 µg/L, median(min/max)	16.5 (3.0/156.0)
Calcium mg/dl, mean (SS)	9.35 (0.55)
Phosphorus mg/dl, mean (SS)	3.62 (0.65)
ALP U/L, median(min/max)	94.0 (38.0/393.0)
PTH ng/L, median(min/max)	41.9 (9.8 /289.0)

ALP: Alkaline phosphatase, PTH: Parathormone

Table 5. Bone Mineral Density Measurements of Patients

n=121	**Median(min/max)**
Femoral neck T score	-1.5 (-4.2/2.2)
Femoral total T score	-1.0 (-4.1/0.90)
Lumbar total T score	-2.2 (-4.3/2.6)
Femoral total BMD	0.90 (0.48/1.02)
Lumbar total BMD	0.81 (-2.5/1.42)

BMD: Bone Mineral Density

Discussion

In the current study, clinical and demographic data of 121 patients who were followed up and treated with the diagnosis of fragility fracture in the Physical Medicine and Rehabilitation Clinic of our hospital are presented.

The effect of body weight on fracture has been studied in various studies. In a study examining the characteristics of patients with osteoporotic hip fractures, it was shown that 49% of the patients had low body weight.[11] Similar results were obtained in two other studies, and it was

thought that reduction of protective adipose tissue and malnutrition were effective in this situation.[12,13] On the other hand, the mean BMI of the patients was found within the normal range. The effect of BMI on fracture risk has generally been studied in studies of hip fracture. Wardlaw GM et al.[14] defined the actual effect of BMI on the risk of non-hip fractures as uncertain. The fact that our study included patients with fractures not only in the hip but also in the vertebrae, forearm, proximal humerus and forearm regions, and differences in the number of patients in the studies may have been effective in obtaining different results.

The environmental characteristics and the lack of family support are among the factors that can lead to fragility fracture. In our study, it was observed that 13% of the patients lived alone, and in a previous study, this rate was 17%, similar to ours.[11] In the literature, it is emphasized that fragility fractures of the vertebrae are less associated with falls or trauma, unlike hip and forearm fractures.[15] In our current study, although factors were not analyzed separately for each region of fracture, when all patients were examined, the median number of falls in the last year was 1, and 43% of patients had comorbidities that increased the risk of osteoporosis.

Drugs such as glucocorticoids, proton pump inhibitors, aromatase inhibitors, thyroid hormone preparations, antiepileptics, warfarin, and nucleotide reverse transcriptase inhibitors are known to induce osteoporosis.[16] 62 (51.2%) of all patients evaluated in our study, 12 (%46.1) of those with vertebral fractures were using at least one of these drugs. These data are consistent with studies that draw attention to etiological factors other than falls in fragility fractures.[15,17]

Previous fracture increases risk of new fracture regardless of bone density.[18] When all fractures are taken together, having an osteoporotic fracture increases the risk of developing new fractures 2.2 times.[19] There are various studies investigating the characteristics of recurrent fragility fractures.[20,21] In the study of Dang DY et al.[20], patients with fragility fractures were followed up for three years, and it was found that vertebral fractures, followed by proximal humerus fractures, were most associated with secondary fractures, considering all initial fracture types. It was observed that the secondary fracture site was mostly the hip. Focusing more on the fracture healing process in upper extremity fractures and ignoring follow-up and treatment for the prevention of secondary fractures may be important in achieving this result. In a study by Viprey M et al.[22], 455 patients with proximal humerus and distal radius fractures who did not receive osteoporosis treatment before the fracture were examined. In the first year after the fracture, it was observed that only 29.4% of them received calcium/vitamin D support treatment, and 9.4% received pharmacological osteoporosis treatment (bisphosphonate, strontium ranelate, hormone replacement therapy, raloxifene).[22]

In our study, it was seen that the first fracture site associated with recurrent fracture was the forearm and hip, with the most 9 (36%) patients. The difference in this result from the literature may have been due to the change in the number of patients examined. In our study, it was also seen that 25 (20.6%) patients had a previous fragility fracture and the secondary fracture site was the hip with a maximum rate of 32%, similar to the literature. Considering that the mortality of hip fracture is high, when a fracture is encountered, whether this fracture is a fragility fracture, the risk of recurrence, the importance of close follow-up and treatment should be considered once again.

In a study comparing the characteristics of patients with osteoporosis with vertebral fractures, hip fractures and no fractures, no statistically significant difference was found between the number of chronic diseases and family history of fracture, BMI, menopause ages, smoking, dietary calcium intake, coffee and alcohol consumption.[23] In the same study, it was observed that the vertebral T-scores of the group with vertebral fractures and the hip T-scores of the group with hip fractures were lower.[23] This is consistent with studies stating that BMD in a region is the best indicator of the fracture probability of that region.[24,25] On the other hand; there are also studies emphasizing that the majority of fractures are seen in women with normal bone mineral density.[26,27] In our study, however, T scores were not compared according to the fracture site; however, medians of both lumbar total T score and femoral neck T score were better than other studies. It was remarkable that although most patients had fragility fractures, their BMD was not osteoporotic. In addition, our patients had low vitamin D levels, dietary calcium and protein intakes, and most of the patients did not have sufficient physical activity levels. This situation highlights the necessity of questioning the risk factors, drugs used and other fracture-related factors in postmenopausal women and men over 50 years of age.

When studies investigating the treatment of osteoporosis after hip fracture were examined, it was observed that the rates of initiation of osteoporosis treatment after fracture ranged from 5% to 30%.[6] Regular follow-up of patients with fragile fractures is therefore very important for the prevention of recurrent fractures. Fracture liaison units have recently been established for this purpose in the world and in our country, and individuals with fragility fractures have been closely followed up and treated.[28]

Our study has some limitations such as being a retrospective file review study and small number of patients. We think that the effective factors in fragility fractures can be revealed in more detail with multicenter and multidisciplinary studies in which more patients are examined.

In conclusion; osteoporosis is an important public health problem that can affect the quality of life of patients and lead to complications that require long-term and expensive treatments and even death. Although patients with fractures are not always severely osteoporotic, secondary causes of osteoporosis such as low vitamin D levels, insufficient dietary calcium and protein intake, inadequate physical activity, and the use of various drugs

stand out. Early diagnosis of osteoporosis by questioning the risk factors, and when fragility fractures are detected, providing appropriate pharmacological and non-pharmacological treatments and closely monitoring these patients are very important. Knowing the factors associated with fragility fractures will facilitate the identification of high-risk individuals and will provide an idea for preventive measures and systematic approaches.

Compliance with Ethical Standards

Ethics committee approval for the study was obtained from the University of Health Sciences Diskapi Yildirim Beyazit Education and Research Hospital Clinical Research Ethics Committee (139/29).

Conflict of Interest

There is no conflict of interest between the authors.

Author Contribution

Z.K.U., A.E.Ş., Y.Ö.G. and E.Ü.A. data collection, Z.K.U., A.E.Ş. and Y.Ö.G. data proceessing, Z.K.U. and D.C. analysis, D.C. and E.Ü.A. supersivion and all authors have read and accepted the article.

Financial support

The authors have not declared financial support.

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