Research Article / Araştırma Makalesi

Evaluation of Osteoporosis Risk and Awareness in Women Aged 45 and Over Admitted to a University Hospital

Bir Üniversite Hastanesine Başvuran 45 ve Üzeri Yaş Grubu Kadınlarda Osteoporoz Riski ve Osteoporoz Farkındalığının Değerlendirilmesi

[1]Mine Tepetaş, [1]Alaettin Ünsal, [2]Ali Kılınç, [3]Sevda Sungur, [4]Zehra Akdağ, [1]Erman Kavlu, [1]Didem Arslantaş

[1]Eskişehir Osmangazi University, Faculty of Medicine, Departmant of Public Health; Eskişehir, Türkiye
[2] Beyşehir District Health Directorate, Konya, Türkiye
[3] Eskişehir Tepebaşı District Health Directorate, Eskişehir, Türkiye
[4] Ankara Etlik City Hospital, Department of Psychiatry, Ankara, Türkiye

Abstract: Osteoporosis is a metabolic disease that disrupts the microarchitecture of the bone. As life expectancy increases, so does the frequency of osteoporosis. Osteoporosis is a preventable disease and its progression can be slowed. The aim of this study is to assess the risk and awareness of osteoporosis in women and to investigate the variables thought to be associated with it. This cross-sectional study was conducted on 451 women aged 45 years and older. The Osteoporosis Risk Scale (ORS) and the Osteoporosis Awareness Scale (OAS) were used in this study. The study group consisted of women aged 45 to 85 years, with an average age of 57.8 ± 9.3 years. In this study, 402 women were found to be at risk for osteoporosis. The women's ORS scores ranged from 5 to 40, with an average of 19.6 ± 4.2 points. OAS scores ranged from 27 to 107, with an average of 57.7 ± 15.0. A weak negative correlation was found between ORS scores and OAS scores. This study found that 89.1% of women were at risk for osteoporosis. Women who were not obese, were not taking medication for osteoporosis in postmenopause and did not have a medically diagnosed bone disease had a higher risk of osteoporosis. Women's awareness of osteoporosis was moderate. Any educational movement to protect against osteoporosis, a preventable disease, will protect society from osteoporosis by empowering individuals to recognize their own risk factors and take steps to reduce them.
Keywords: Osteoporosis, women, 45 years and above, osteoporosis risk, osteoporosis awareness

Özet: Osteoporoz, kemiklerin mikro mimari yapısını bozan metabolik bir hastalıktır. Yaşam süresi uzadıkça osteoporoz sıklığı da artmaktadır. Osteoporoz önlenebilir bir hastalıktır ve ilerlemesi yavaşlatılabilir. Bu çalışmanın amacı kadınlarda osteoporoz riskini ve farkındalığını değerlendirmek ve ilişkili olduğu düşünülen değişkenleri incelemektir. Bu kesitsel çalışma 45 yaş ve üzeri 451 kadın üzerinde yürütülmüştür. Çalışmada Osteoporoz Risk Ölçeği (ORÖ) ve Osteoporoz Farkındalık Ölçeği (OFÖ) kullanılmıştır. Çalışma grubu, yaş ortalaması 57,8 ± 9,3 yıl olan 45-85 yaş arası kadınlardan oluşmaktadır. Bu çalışmada 402 kadının osteoporoz açısından risk altında olduğu tespit edilmiştir. Kadınların ORÖ skorları 5 ila 40 arasında değişmekte olup ortalama 19,6 ± 4,2 puandır. OFÖ skorları 27 ile 107 arasında değişmekte olup ortalama skor 57,7 ± 15,0'dir. ORÖ skorları ile OFÖ skorları arasında zayıf bir negatif korelasyon bulunmuştur. Bu çalışmada kadınların %89,1'inin osteoporoz riski altında olduğu bulunmuştur. Obez olmayan, postmenopozal dönemde osteoporoz için ilaç kullanmayan ve tıbbi olarak teşhis edilmiş kemik hastalığı olmayan kadınlarda osteoporoz riski daha yüksekti. Kadınların osteoporoz konusundaki farkındalığı orta düzeydeydi. Önlenebilir bir hastalık olan osteoporozdan korunmaya yönelik her türlü farkındalık hareketi bireylerin kendi risk faktörlerini tanımasını ve bunları azaltmak için önlem almasını sağlayarak osteoporoza karşı toplumu koruyacaktır.
Anahtar Kelimeler: Osteoporoz, kadın, 45 yaş ve üstü, osteoporoz riski, osteoporoz farkındalığı

ORCID ID of the authors: MT. 0000-0003-4747-7220, AÜ. 0000-0001-8353-1605, AK. 0000-0002-0577-8570, SS. 0000-0002-0186-0331, ZA. 0009-0005-7573-2913, EK. 0009-0006-8542-150X,DA. 0000-0002-5263-3710

Received 19.04.2024 ***Accepted*** 05.08.2024 ***Online published*** 06.08.2024

Correspondence: Mine TEPETAŞ– Eskişehir Osmangazi University, Faculty of Medicine, Departmant of Public Health; Eskişehir, Türkiye
e-mail: minetepetas@gmail.com

1. Introduction

Osteoporosis is a metabolic disease that leads to deterioration of the microarchitectural structure of bone due to decreased mineral density, resulting in increased bone fragility (1). Osteoporosis has two main risk factors: genetic predisposition and lifestyle. Genetic risk factors include being white, female and having a family history of hip fractures, as well as certain conditions such as cystic fibrosis, porphyria, Marfan syndrome and homocystinuria. Lifestyle-related risk factors include a low body mass index, frequent falls, smoking and alcohol consumption, vitamin D deficiency, a sedentary lifestyle and immobility. Many factors known to cause osteoporosis are also important risk factors for this condition. Excessive caffeine consumption, a diet low in calcium and protein and high in sodium are other factors that increase the risk of osteoporosis. Chronic diseases such as rheumatoid arthritis, chronic liver disease, heart failure, hyperparathyroidism, diabetes mellitus, Cushing's syndrome, chronic renal failure and hypogonadism can promote the development of osteoporosis (2). Conditions such as early menopause (before the age of 45), late menarche (after the age of 15), absence of childbirth and prolonged secondary amenorrhoea, which can lead to oestrogen hormone deficiency, are known to increase the risk of osteoporosis (3).

According to the International Osteoporosis Foundation (4), more than 500 million people over the age of 50 are affected by osteoporosis worldwide. The National Osteoporosis Foundation of the United States reports that more than 54 million people are at risk of osteoporosis (5). In the European region, approximately 32 million people have been diagnosed with osteoporosis (6). According to the FRACTURK study conducted in 2012 by the Turkish Osteoporosis Association and the Turkish Statistical Institute, 50% of people over the age of 50 are diagnosed with osteopenia and 25% with osteoporosis (7).

In recent years, the incidence of osteoporosis has increased due to people's increased life expectancy. The number of fractures associated with osteoporosis has also increased. Osteoporosis leads to hospitalizations due to the negative health consequences. It is estimated to cause more economic losses than diseases with high morbidity and mortality such as cancer, hypertension and rheumatological diseases (8).

Osteoporosis is a major health problem, especially for women. It is estimated that about 80% of osteoporosis patients are women, which may explain the high morbidity and mortality of osteoporosis in postmenopausal women (9). One of the most important complications of osteoporosis is bone fractures. Non-traumatic injuries occur in over 30% of women over 75 years of age and in about 50% of women over 85 years of age. It is estimated that additional vertebral fractures occur. Fractures can lead to restricted movement, short stature and chronic pain. According to one report, new fractures occurring at an older age can lead to an increase in disability (10).

Patients diagnosed with osteoporosis have a higher risk of hip fractures. It is estimated that one in five older people will suffer a hip fracture in their lifetime. Hip fractures have serious negative health consequences, with around 20-40% of patients dying within a year. Therefore, hip fracture is the most serious negative health consequence of osteoporosis (11). In Türkiye, the incidence of hip fractures is lower than in European countries, but it is gradually increasing (12).

Osteoporosis is a preventable disease and its progression can be slowed down. To prevent osteoporosis, it is crucial to eliminate known risk factors such as smoking and alcohol consumption and to supplement the diet with calcium. Preventing osteoporosis includes raising awareness of the disease, including calcium in the diet, exercising regularly, not smoking or drinking alcohol, and considering hormone therapy after menopause (2). It is particularly important to raise awareness of osteoporosis. It is important to raise awareness of osteoporosis, especially among women and older people who are at higher risk. This can be achieved by providing them

with knowledge about osteoporosis and its effects. Raising awareness will help to take preventive measures.

Osteoporosis is a preventable disease that can lead to morbidity and mortality, especially in postmenopausal women. It is important for individuals to be aware of osteoporosis in order to prevent it. The aim of this study was to determine the osteoporosis risk of women aged 45 years and older who had applied to Eskişehir Osmangazi University Health, Practice and Research Hospital for any reason, to investigate some variables thought to be related to osteoporosis, and to evaluate osteoporosis awareness.

2. Materials and Methods

The study is a cross-sectional study conducted on women aged 45 years and older who presented to Eskişehir Osmangazi University (ESOGU) Health, Practice and Research Hospital for any reason between January 18, 2023 and April 30, 2023. ESOGU Noninvasive Clinical Research Ethics Committee approval No. 37 dated 17.01.2023 was obtained to conduct this study. The necessary approvals were obtained from the Chief Medical Officer of ESOGU Health Practice and Research Hospital for data collection in the study.

In our study, a questionnaire based on the literature was used for data collection (6,9). The questionnaire included some sociodemographic characteristics of the women who applied to the hospital (age, marital status, education level, family income, etc.), some variables thought to be related to the risk of osteoporosis (smoking status, menopausal status, use of medications containing steroids/cortisone, etc.), ORS questions and OAS questions.

The number of women to be included in the study was determined to be at least 384 using the G Power program (v 3.1) (osteoporosis prevalence in Turkey: 50%, margin of error: 5%, confidence interval: 95%). The study group consisted of a total of 451 adult female patients who were admitted to the hospital during the data collection period and agreed to participate in the study. During the study, women aged 45 years and older who had applied to the hospital for any reason were interviewed in the general waiting rooms of the outpatient clinics and informed about the subject and purpose of the study. After verbal consent to participate in the study was obtained, the women to be observed completed the prepared questionnaires. This process took about 10-15 minutes.

The ORS was used to determine the women's risk of osteoporosis. This scale was developed by Kayacan et al. in 2011 and consists of 16 questions. Questions 1, 2, 6 and 15 of the scale range from 0 to 1, question 4 ranges from 0 to 2, questions 3 and 5 range from 0 to 3 and questions 7, 8, 9, 10, 11, 12, 13, 14 and 16 range from 0 to 4. The scores achievable with the scale range from 0 to 48, with those achieving a score of 17 and above being considered at risk of osteoporosis (13).

In this study, the OAS was used to assess the level of osteoporosis awareness in women. This scale was developed by Choi et al. (14) in 2008 and their Turkish validity and reliability study was conducted by Aktürk et al. (15) in 2021. The scale consists of 27 4-point Likert-type questions. The answers to the questions are rated as follows: "I know very well (4)", "I know (3)", "I know a little (2)", "I don't know at all (1)". The scale ranges from 27-108, and the higher the score, the better the level of awareness about osteoporosis.

In our study, obesity was defined as a body mass index of 30 or higher. The income status of the family was defined as "poor"," "medium" and "good" according to the women's own assessment. Smokers were defined as those who smoked at least one cigarette per day. "Regularly physically active" was defined as people who were physically active for 30 minutes per day at moderate intensity (brisk walking, slow running, swimming, gardening, sports/fitness)".

The data obtained was analyzed on a computer using the statistical program SPSS (v15.0). The Shapiro-Wilk test was used to assess the suitability of the data for normal distribution. The chi-square test and Spearman

correlation analysis were used for statistical analysis. In Spearman correlation analysis, the r value between 0.000-0.299 indicates a weak relationship, between 0.300-0.700 indicates a moderate relationship, between 0.701-0.990 indicates a strong relationship, and 0.991 and above indicates a perfect relationship (13). $p \leq 0.05$ was accepted as the value for statistical significance.

3. Results

The age of the study group ranged from 45 to 85 years, and the mean age was 57.8 ± 9.3 years. In the study group, 130 (28.8%) were obese, 337 (74.7%) were married, 165 (36.6%) had a secondary school degree or less, and 324 (71.8%) reported having a median family income. In this study, 402 (89.1%) of the women were found to be at risk of osteoporosis. The distribution of those with and without osteoporosis risk in the study group according to some sociodemographic characteristics is shown in Table 1.

Table 1. The distribution of people with and without osteoporosis risk in the study group according to some sociodemographic characteristics

Sociodemographic characteristics	Risk of osteoporosis			Test value x^2; p
	No n(%) [a]	Yes n(%) [a]	Total n(%) [b]	
Age group (years)				
Under 59	30 (10.6)	252 (89.4)	282 (62.5)	0.002; 0.965
60 and above	19 (11.2)	150 (88.8)	169 (37.5)	
Obesity				
No	24 (7.5)	297 (92.5)	321 (71.2)	**12,014; 0.001**
Yes	25 (19.2)	105 (80.8)	130 (28.8)	
Marital status				
Married	34 (10.1)	303 (89.9)	337 (74.7)	0.542; 0.462
Not married	15 (13.2)	99 (86.8)	114 (25.3)	
Education status				
Middle school and below	17 (9.3)	165 (90.7)	165 (36.6)	2,454; 0.293
High school	12 (9.3)	117 (90.7)	129 (28.6)	
University and above	20 (14.3)	120 (85.7)	140 (31.0)	
Family income status				
Bad	3 (8.1)	34 (91.9)	37 (8.2)	0.903; 0.637
Middle	34 (10.5)	290 (89.5)	324 (71.8)	
Good	12 (13.3)	78 (86.7)	90 (20.0)	
Total	49 (10.9)	402 (89.1)	451 (100.0)	-

a : Row percentage, b : Column percentage

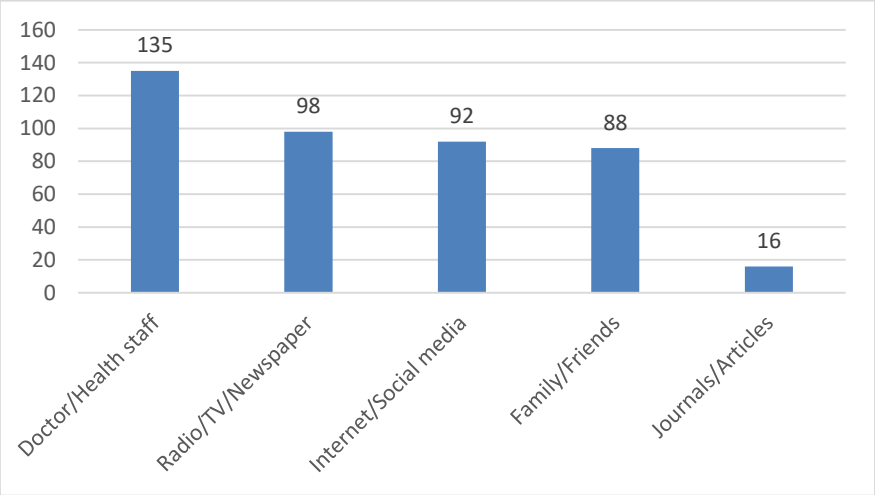
108 (23.9%) of the women reported smoking, 378 (83.8%) reported being menopausal, 60 (15.9%) reported taking osteoporosis medications during menopause, 41 (9.1%) reported taking corticosteroid medication, 334 (74.1%) had previously been informed about osteoporosis, 157 (34.8%) had a family history of osteoporosis, 237 (52.5%) stated that they were regularly physically active. The distribution of people with and without osteoporosis risk in the study group according to some osteoporosis-related characteristics is shown in Table 2.

Table 2. The distribution of people with and without osteoporosis risk in the study group according to some osteoporosis-related characteristics

Some variables associated with osteoporosis risk	Risk of osteoporosis			Test value
	No n (%) [a]	**Yes** n (%) [a]	Total n (%) [b]	**x [2] ; p**
Smoking status				
Not smoking	42 (12.2)	301 (87.8)	343 (76.1)	2,254; 0.133
Smoking	7 (6.5)	101 (93.5)	108 (23.9)	
Menopausal status				
No	5 (6.8)	68 (93.2)	73 (16.2)	0.998; 0.318
Yes	44 (11.6)	334 (88.4)	378 (83.8)	
Medication use for osteoporosis in the postmenopausal period*				
No	29 (9.1)	289 (90.9)	318 (84.1)	**10,881; 0.001**
Yes	15 (25.0)	45 (75.0)	60 (15.9)	
History of any physician-diagnosed chronic disease				
No	12 (7.0)	159 (93.0)	171 (37.9)	3,594; 0.058
Yes	37 (13.2)	243 (86.6)	280 (62.1)	
History of using any medication containing corticosteroids				
No	44 (10.7)	366 (89.3)	410 (90.9)	Fisher's ; 0.792
Yes	5 (12.2)	36 (87.8)	41 (9.1)	
Previous history of learning about osteoporosis				
No	14 (12.0)	103 (88.0)	117 (25.9)	0.074; 0.786
Yes	35 (10.5)	299 (89.5)	334 (74.1)	
History of knowledge about bone mineral density measurement				
No	22 (9.3)	215 (90.7)	237 (52.5)	0.970; 0.325
Yes	27 (12.6)	187 (87.4)	214 (47.5)	
History of previous bone mineral density measurement				
No	25 (9.4)	242 (90.6)	267 (59.2)	1,167; 0.280
Yes	24 (13.0)	160 (87.0)	184 (40.8)	
History of any physician-diagnosed bone disease				
No	26 (7.9)	303 (92.1)	329 (72.9)	**9,917; 0.002**
Yes	23 (18.9)	99 (81.1)	122 (27.1)	
Family history of osteoporosis				
No	29 (9.9)	265 (90.1)	294 (65.2)	0.602; 0.438
Yes	20 (12.7)	137 (87.3)	157 (34.8)	
Regular physical exercise status				
No	26 (12.1)	188 (87.9)	214 (47.5)	0.465; 0.495
Yes	23 (9.7)	214 (90.3)	237 (52.5)	
Total	49 (10.9)	402 (89.1)	451 (100.0)	-

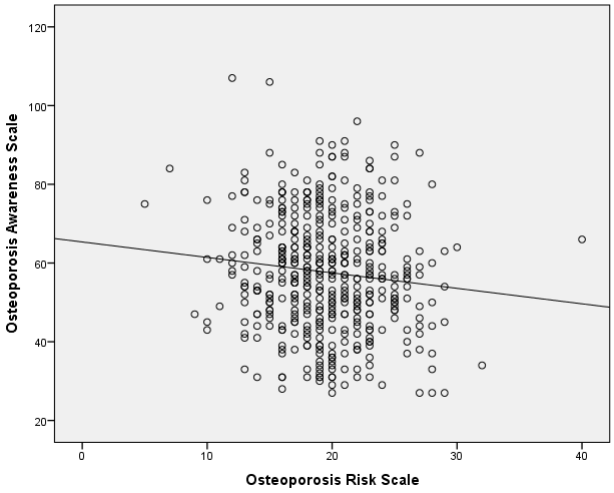
[a] : Row percentage, [b] : Column percentage, *: The evaluation was made on menopausal women.

117 (25.9%) of the study participants stated that they had never heard of osteoporosis. Of those who stated that they had already learned about osteoporosis, the most common sources of information were "health professionals/doctors" at 31.5% and "radio/TV/newspapers" at 22.8%. The distribution of sources from which the study participants stated that they had obtained information about osteoporosis is shown in Graph 1.



Graph 1. The distribution of sources from which the study participants stated that they had obtained information about osteoporosis (Numbers were calculated based on the answers given)

The women's scores on the Osteoporosis Risk Scale ranged from 5 to 40, with an average of 19.6 ± 4.2 (median: 19.0) points. On the Osteoporosis Awareness Scale, they scored between 27and 107, with a mean of 57.7 ± 15.0 (median: 57.0) points. A weak negative correlation was found between the results of the Osteoporosis Risk Scale and the results of the Osteoporosis Awareness Scale (r=-0.099, p=0.036). The distribution of the women's scores on the Osteoporosis Risk Scale and the Osteoporosis Awareness Scale is shown in Graph 2.



Graph 2. The distribution of the women's scores on the Osteoporosis Risk Scale and the Osteoporosis Awareness Scale

4. Discussion and Conclusion

Osteoporosis is a disease that can be prevented and whose progression can be slowed down. Especially in postmenopausal women, the decline in estrogen levels, a protective hormone against osteoporosis, is an important factor that increases the risk of osteoporosis (14). Identifying people at high risk of osteoporosis and raising awareness of this issue is very important to reduce the morbidity and mortality caused by osteoporosis.

Although it is known that the risk of osteoporosis is lower in obese people and osteoporosis-related fractures are less frequent, some studies conducted in recent years have reported that internal organ fat causes an increased inflammatory response in obese people and the resulting accelerated loss of bone tissue increases the risk of osteoporosis (15–17). In our study, the risk of osteoporosis was found to be lower in obese women than in non-obese women. A study by Gandham et al. reports that the risk of developing osteoporosis and bone fractures in old age increases with decreasing body mass index (18). A study by Compston et al. reported that obesity is not a significant risk factor for osteoporosis (19). Gaining scientific knowledge is a dynamic process. Therefore, the discovery of new information may change some of the existing information. One of the reasons for the different results reported in the studies could be the evolution of scientific knowledge over time.

One of the main reasons for the development of osteoporosis in postmenopausal women is bone loss due to estrogen deficiency. During this time, it may be useful to compensate for the estrogen deficiency with medication to protect against osteoporosis (20). This study showed that the risk of osteoporosis was lower in postmenopausal women who took osteoporosis medication. A study conducted by Ji et al. reported that the risk of osteoporosis was lower in women taking osteoporosis prevention medication (21). In a study by Kaplan et al. it was reported that there was no difference in osteoporosis risk between those who took medication to prevent osteoporosis and those who did not (22). The reasons for the different results in the studies include the different methods used to assess the risk of osteoporosis.

It is known that the incidence of osteoporosis is higher in people with a history of chronic disease (2). This could be due to the fact that some of the drugs used to treat chronic diseases cause osteoporosis. In our study, there was no difference in osteoporosis risk between those with a history of chronic disease and those without. 62.1% of the study group had a history of doctor-diagnosed chronic disease. The most common of these diseases were hypertension, diabetes mellitus, goiter and asthma/COPD. In a study by Pınar et al. it was reported that diabetes mellitus, hyperthyroidism and rheumatic diseases were the most common diseases among the participants. In a study by Umay et al. it was reported that hypertension, diabetes mellitus and thyroid diseases were the most common diseases among the participants (23). The reasons for the different results in the studies could be that the study groups had different socio-demographic characteristics.

It was found that 74.1% of the study group already knew about osteoporosis. There was no difference in risk between those who already knew about osteoporosis and those who did not. The most common sources from which women get information about osteoporosis are: healthcare professionals/doctors, radio/TV/newspapers and internet/social media. In a study conducted by Elsabagh et al, participants' knowledge of osteoporosis was inadequate and the sources from which they obtained information were as follows: Television/mass media, friends/family and healthcare professionals (24). In the Barzanji et al. study, 56.6% of participants were knowledgeable about osteoporosis and the most common sources from which they obtained their information were: Television, friends/family and magazines/newspapers (25). One of the reasons for the different results in the studies could be that the women have different socio-cultural characteristics because they come from different countries.

The most effective measure to prevent osteoporosis is to take protective measures to prevent the development of the disease. Women with high osteoporosis awareness are expected to take precautionary measures by knowing their risks and trying to reduce their risk of osteoporosis. This study found that women's risk of osteoporosis decreased as their awareness of osteoporosis increased. A study conducted by Bayındır et al. reported that no association was found between the level of osteoporosis awareness and the risk of osteoporosis (26). In the study by Lewiecki et al. it was reported that osteoporosis awareness was lower in women at risk of osteoporosis (27). One of the reasons for the different

results of studies on a similar topic in the literature could be the use of different measurement tools to determine osteoporosis risk and osteoporosis awareness.

In this study, most women (89.1%) were found to be at risk of osteoporosis. The risk of osteoporosis is higher in women who are not obese, who are not taking medication for postmenopausal osteoporosis and who do not have a medically diagnosed bone disease. It can be said that women's awareness of osteoporosis is moderate. There is a negative correlation between osteoporosis awareness and osteoporosis risk. Another point that is just as important in preventing osteoporosis as reducing risk factors is increasing awareness of osteoporosis. In this context, it may be useful to plan and implement educational measures for women. Further research is needed on this topic.

5. Limitations

The limitations of this study are that the study was conducted on women who attended the outpatient clinics of a single hospital, that the questionnaires were answered according to the participants' own opinion and therefore subjectively, that it was a cross-sectional study and that the risk of osteoporosis was assessed using questionnaires. Further studies with objective osteoporosis measurements are required.

REFERENCES

1. Rachner TD, Khosla S, Hofbauer LC. Osteoporosis: now and the future. Lancet. 2011;377(9773):1276–87.
2. Kling JM, Clarke BL, Sandhu NP. Osteoporosis prevention, screening, and treatment: a review. J women's Heal. 2014;23(7):563–72.
3. Eroğlu K, Karaöz S, Akkuzu G. Osteoporoz için risk faktörleri ve önlenmesi. SDÜ Tıp Fakültesi Derg. 1997;4(2).
4. International Osteoporosis Foundation. Epidemiology Of Osteoporosis And Fragility Fractures [Internet]. [cited 2023 Aug 8]. Available from: https://www.osteoporosis.foundation/facts-statistics/epidemiology-of-osteoporosis-and-fragility-fractures
5. Endicott RD. Knowledge, health beliefs, and self-efficacy regarding osteoporosis in perimenopausal women. J Osteoporos. 2013;2013(1).
6. Kanis JA, Norton N, Harvey NC, Jacobson T, Johansson H, Lorentzon M, et al. SCOPE 2021: a new scorecard for osteoporosis in Europe. Arch Osteoporos. 2021;16(1):82.
7. Tüzün Ş. Epidemiyoloji Türkiye Çalışması Fracturk. Osteoporozda Tanı ve Tedavi İstanbul Galenos Yayınevi. 2012;22–34.
8. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int. 2006;17:1726–33.
9. Pınar G, Pınar T, Doğan N, Karahan A, Algıer L, Abbasoğlu A, et al. Kırk beş yaş ve üstü kadınlarda osteoporoz risk faktörleri. Dicle Med Journal/Dicle Tip Derg. 2009;36(4).
10. Crans GG, Silverman SL, Genant HK, Glass E V, Krege JH. Association of severe vertebral fractures with reduced quality of life: reduction in the incidence of severe vertebral fractures by teriparatide. Arthritis Rheum. 2004;50(12):4028–34.
11. Guzon-Illescas O, Perez Fernandez E, Crespí Villarias N, Quirós Donate FJ, Peña M, Alonso-Blas C, et al. Mortality after osteoporotic hip fracture: incidence, trends, and associated factors. J Orthop Surg Res. 2019;14(1):1–9.
12. Tuzun S, Eskiyurt N, Akarirmak U, Saridogan M, Senocak M, Johansson H, et al. Incidence of hip fracture and prevalence of osteoporosis in Turkey: the FRACTURK study. Osteoporos Int. 2012;23:949–55.
13. Heiman GW. Basic statistics for the behavioral sciences. Houghton Mifflin Boston, MA; 1992.
14. Tella SH, Gallagher JC. Prevention and treatment of postmenopausal osteoporosis. J Steroid Biochem Mol Biol. 2014;142:155–70.
15. Kaze AD, Rosen HN, Paik JM. A meta-analysis of the association between body mass index and risk of vertebral fracture. Osteoporos Int. 2018;29:31–9.
16. Van der Voort DJM, Geusens PP, Dinant GJ. Risk factors for osteoporosis related to their outcome: fractures. Osteoporos Int. 2001;12:630–8.
17. Piñar-Gutierrez A, García-Fontana C, García-Fontana B, Muñoz-Torres M. Obesity and bone health: a complex relationship. Int J Mol Sci. 2022;23(15):8303.
18. Gandham A, Zengin A, Bonham MP, Winzenberg T, Balogun S, Wu F, et al. Incidence and predictors of fractures in older adults with and without obesity defined by body mass index versus body fat percentage. Bone. 2020;140:115546.

19. Compston JE, Watts NB, Chapurlat R, Cooper C, Boonen S, Greenspan S, et al. Obesity is not protective against fracture in postmenopausal women: GLOW. Am J Med. 2011;124(11):1043–50.
20. Gambacciani M, Levancini M. Hormone replacement therapy and the prevention of postmenopausal osteoporosis. Menopause Rev Menopauzalny. 2014;13(4):213–20.
21. Ji MX, Yu Q. Primary osteoporosis in postmenopausal women. Chronic Dis Transl Med. 2015;1(1):9–13.
22. Kaplan S, Sergek E, Sertbaş G. Postmenapozal dönem kadınlarda kalkaneus kemik mineral yoğunluğunu etkileyen risk faktörlerinin belirlenmesi. Anadolu Hemşirelik ve Sağlık Bilim Derg. 2010;8(3):76–89.
23. Umay E, Tamkan U, Gündoğdu İ, Umay S, Çakcı A. Osteoporoz risk faktörlerinin kemik mineral yoğunluğuna etkisi. Turk J Osteoporos. 2011;17(2):0.
24. Elsabagh HM, Aldeib AF, Atlam SA, Saied SM. Osteoporosis knowledge and health beliefs among employees of Tanta University. Am J Res Commun. 2015;3(12):62–77.
25. Barzanji AT, Alamri FA, Mohamed AG. Osteoporosis: a study of knowledge, attitude and practice among adults in Riyadh, Saudi Arabia. J Community Health. 2013;38:1098–105.
26. Bayındır Çevik A, Pekmezci H, Koçan S. Sağlık eğitimi alan kız öğrencilerin osteoporoz risk faktörleri ve farkındalıklarının değerlendirilmesi. 2016;
27. Lewiecki EM, Leader D, Weiss R, Williams SA. Challenges in osteoporosis awareness and management: results from a survey of US postmenopausal women. J drug Assess. 2019;8(1):25–31.

Ethic

Ethics Committee Approval: The study was approved by Eskişehir Osmangazi University Noninterventional Clinical Research Ethical Committee (Decision no: 37, Date: 17.01.2023).

Authorship Contributions: Concept: MT, AÜ, AK, SS, ZA, EK, DA. Design: MT, AK, SS, ZA, EK. Data Collection or Processing: MT, AK, SS, ZA, EK. Analysis or Interpretation: MT, AÜ, AK, SS, ZA, EK, DA. Literature Search: MT, AK, SS, ZA, EK. Writing: MT, AÜ, AK, SS, ZA, EK, DA.

Copyright Transfer Form: Copyright Transfer Form was signed by all authors.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support