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Awareness of osteoporosis, osteoporosis knowledge levels, and associated factors in individuals with Rheumatoid Arthritis

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Abstract

Objective: Osteoporosis is common in patients with rheumatoid arthritis (RA). It is known that osteoporosis is underdiagnosed and undertreated in patients with RA. The aim of this study was to assess the awareness and knowledge levels of osteoporosis in patients diagnosed with RA.

Methods: A total of 110 RA patients (17 men,93 women; mean age: 57.71±11.27 years) were included in the cross-sectional study. Demographic data, disease duration, and medications used by the participants were noted. General questions about osteoporosis, diet, and exercise were asked. Osteoporosis knowledge was assessed using the Revised Osteoporosis Knowledge Test, while awareness was assessed using the Osteoporosis Awareness Scale.

Results: Osteoporosis knowledge (12.44±5.95) and awareness (10.57±5.2) of RA patients were found to be low. 67.3% of the participants did not know that they were in the risk group. As the level of education increased, the knowledge and awareness of osteoporosis also increased. Participants who had a history of fractures, who were regularly monitored for osteoporosis and were taking vitamin D, were found to have higher levels of osteoporosis knowledge and awareness.

Conclusion: The results of this study indicate that RA patients have low levels of osteoporosis knowledge and awareness. Patient education programs should be organized especially for RA patients in order to reduce the incidence of osteoporosis and the morbidity and mortality that may occur due to osteoporosis.

Keywords: Awareness, knowledge, osteoporosis, rheumatoid arthritis

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Romatoid Artritli bireylerde osteoporoz farkındalığı, osteoporoz bilgi seviyeleri ve ilişkili faktörler

Öz

Amaç: Osteoporoz, romatoid artritli (RA) hastalarda yaygındır. RA'lı hastalarda osteoporozun yetersiz teşhis ve yetersiz tedavi edildiği bilinmektedir. Bu çalışmanın amacı RA tanısı almış hastalarda osteoporoz hakkındaki farkındalık ve bilgi düzeylerini değerlendirmektir.

Yöntemler: Kesitsel çalışmaya toplam 110 RA hastası (17 erkek, 93 kadın; ortalama yaş: 57.71±11.27 yıl) dahil edildi. Katılımcıların demografik verileri, hastalık süreleri ve kullandıkları ilaçlar kaydedildi. Osteoporoz, diyet ve egzersiz hakkında genel sorular soruldu. Osteoporoz bilgisi Revize Osteoporoz Bilgi Testi ile, farkındalık ise Osteoporoz Farkındalık Ölçeği ile değerlendirildi.

Bulgular: RA hastalarının osteoporoz bilgisi (12.44±5.95) ve farkındalığı (10.57±5.2) düşük bulunmuştur. Katılımcıların %67,3'ü risk grubunda olduğunu bilmiyordu. Eğitim düzeyi arttıkça osteoporoz bilgi ve farkındalığı da artmaktadır. Kırık öyküsü olan, düzenli osteoporoz takibi yapılan ve D vitamini kullanan katılımcıların osteoporoz bilgi ve farkındalık düzeyleri daha yüksek bulunmuştur.

Sonuç: Bu çalışmanın sonuçları RA hastalarının osteoporoz bilgi ve farkındalık düzeylerinin düşük olduğunu göstermektedir. Osteoporoz insidansını, osteoporoza bağlı oluşabilecek morbidite ve mortaliteyi azaltmak için özellikle RA hastalarına yönelik hasta eğitim programları düzenlenmelidir.

Anahtar kelimeler: Bilgi, farkındalık, osteoporoz, romatoid artrit.

INTRODUCTION

Osteoporosis is a progressive metabolic bone disease characterized by weakening of bones and an increased risk of fracture due to decreased bone density and deterioration of bone microstructure. This disease leads to bones becoming more fragile and increasing the likelihood of fractures, especially in the elderly[1]. It has become a health problem of increasing importance with the aging of the population all over the world[2,3]. In Türkiye, osteoporosis was found to be present in 12.9% of women and 7.5% of men over the age of 50[4].

Risk factors for osteoporosis include sex, ethnicity, older age, family history of osteoporosis or fractures, inadequate calcium intake, sedentary lifestyle (insufficient physical activity), smoking, alcohol use, vitamin D deficiency and caffeine intake[3]. Rheumatoid arthritis (RA), an inflammatory rheumatic disease, is also considered a risk factor for osteoporosis. Osteoporosis is common in people with RA, impacting as many as 30% of the population[5]. Another issue that should be underlined is that patients with RA also have a 60% to 100% increased risk of osteoporotic fractures compared with those without RA. These patients are particularly prone to troubles such as short stature, symptomatic spinal compression fractures, and stress fractures of the metatarsals or long bones of the legs. Prolonged immobilization of patients with fractures increases the lack of normal weight-bearing, resulting in accelerated osteoporosis and decreased new bone formation[6]. Regrettably, it is known that osteoporosis is underdiagnosed and undertreated in patients with RA. This condition is included in the Fracture Risk Calculator (FRAX), but such algorithms may not detect the expected level of osteoporosis because they do not take into account the severity of RA, its duration, and the treatments used against it. The elevated likelihood of osteoporosis in RA has been associated with the patient's underlying inflammation, the use of medications (especially glucocorticoids), alongside reduced

physical activity and shifts in body composition[5,7].

Hien et al. observed that calcium intake increased and bone loss rate was delayed in postmenopausal women after a nutrition education program. This study emphasized that it is possible to create osteoporosis awareness and prevent osteoporosis with education in women in the risk group[8]. It is thought that awareness and knowledge of osteoporosis are important factors in protecting against the condition and its complications. There are studies investigating public knowledge of osteoporosis in Türkiye[9,10]. To our knowledge, only one study investigates osteoporosis awareness, knowledge level, and factors affecting this in the RA patient population[11]. This study aimed to evaluate the awareness and knowledge level of osteoporosis in patients diagnosed with RA. Another study goal was to compare individuals with and without osteoporosis awareness in terms of demographic characteristics.

METHOD

The research received ethical approval from the University's Non-Interventional Clinical Research Ethics Committee, with decision number 875 on September 18, 2024.

The G*Power program was used to calculate the sample size. The preliminary study results showed that the effect size was 0.7 in comparisons of the parameter distributions we examined according to the osteoporosis follow-up. This corresponds to a medium-high level according to Cohen's effect size classification (Cohen, 1988). The statistical significance coefficient with an effect size of 0.7 was accepted as 0.05. It was decided to include at least twenty-six people in each group to obtain 80% power (Total 52).

In accordance with the 2010 American College of Rheumatology/European Alliance of Rheumatology Associations guidelines, [12] patients who were regularly followed up for RA were contacted by telephone and asked whether they would participate in the survey. Inclusion criteria were sufficient language and cognitive function to complete the surveys. Exclusion criteria were other known chronic bone diseases, and being pregnant or lactation. The survey, which was created using Google Forms, was sent to volunteer participants via online portals, professional emails, and social media, to patients with RA. Participants received a survey link that included an information sheet outlining the study objectives. Before answering the survey, participants were informed about the study and asked whether they would like to participate voluntarily. Those who gave their consent online continued to the online survey, while those who refused could not continue. Two hundred patients were contacted, and 120 volunteered to participate in the study. However, only 110 of these patients were able to complete the survey form (Figure 1). The time required to complete all surveys was approximately 15 minutes. The research physician involved in the data collection process provided detailed instructions to participants on how to complete each questionnaire, and participants were able to contact the research physician for answers to any questions they had. Data collection, which was managed by the researcher (D.S.K), followed a standard email protocol.

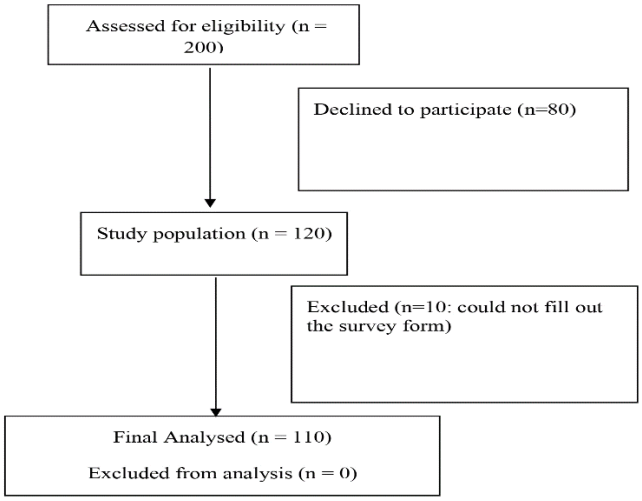

Figure 1. Flow diagram of participation

The researcher prepared the survey form online. The survey form consisted of three parts. The first included sociodemographic data such as age, height, weight, occupation, education level, variables such as RA disease duration, medications used for RA, chronic disease status, alcohol consumption, and smoking. In this section of the survey form, participants were asked general questions about osteoporosis. "Have you ever heard of osteoporosis?", "What is your source of information on osteoporosis?", "Do you have a history of fractures?", "Does your family have a history of fractures due to osteoporosis?", "Have you ever been screened for osteoporosis?", "Have you ever been diagnosed with osteoporosis?", "Do you have regular follow-up for osteoporosis?", "Do you know whether you are in a high-risk group?" and "Have you ever been treated for osteoporosis?" In addition, coffee consumption was classified as 0 cups/day, 1-3 cups/day and ≥4 cups/day. Milk and dairy product consumption was classified as 0 servings/day, 1-3 servings/day and ≥4 servings/day. For exercise habits, the options were: never, <1 day/week, 1-2 days/week and ≥3 days/week. Sunbathing frequency was classified as every day, 2-3 times/week, once a week, 2-3 times/month and almost never.

The second part of the survey included the revised osteoporosis knowledge test (R-OKT) questionnaire form to measure knowledge levels about osteoporosis. The third part of the survey included the osteoporosis awareness scale (OAS) to measure osteoporosis awareness.

The OKT was first developed by Kim and colleagues in 1991.[13] The test was subsequently revised,[14] and the Turkish reliability assessment of the R-OKT test was conducted.[15] It is a 32-question survey that measures the level of knowledge about osteoporosis. The first 11 questions examine the risk factors for osteoporosis. Responses are given by marking the options "There is a high probability of osteoporosis", "It is not related to the development of osteoporosis", "There is a low probability of osteoporosis", and "I don't know" The answers "It is not related to the development of osteoporosis" and "I don't know" are considered incorrect and receive 0 points. The correct answers "There is a high probability of osteoporosis" and "There is a low probability of osteoporosis" are worth one point. The other questions have four choices, and one point is awarded for marking the correct answer. R-OKT has two subscales: The Nutrition subscale contains 26 questions, and the Exercise subscale contains 20 questions. Fourteen questions of these two subgroups are common and considered in the total score, which ranges from 0 to 32. Higher R-OKT total scores indicate greater knowledge of osteoporosis.

The OAS, developed in English by Choi and colleagues in 2008,[16] consists of a total of thirty-one items. The OAS is evaluated according to a 4-point Likert scale type and is scored as "I know very well (4)", "I know (3)", "I know a little (2)", "I don't know at all (1)" As the total score obtained from the scale (min=31, max=124) increases, the awareness of osteoporosis also increases. A validity and reliability study was

conducted in Turkish.[17] Although the scale has no reverse item or cut-off point, as the score obtained from the scale increases, the awareness of osteoporosis increases. The scale includes 5 sub-dimensions such as the bone physiology, the preventive behaviors, the risk factors, the exercise, and the characteristics of osteoporosis.

Statistics

The behavior of quantitative variables was expressed using measures of central tendency and variance: Mean ± SD. To demonstrate the behavioural differences of group means, the ANOVA T-Test (for groups > 2) and Student's T-Test (for groups = 2) were used when the assumptions of normality and homogeneity of variance were met, and the Kruskal-Wallis H-test (for groups > 2) and Mann-Whitney U-Test (for groups = 2) were used when these assumptions were not met. The Bonferroni post hoc correction method was used for multiple comparisons between groups. The non-parametric Spearman's Rank Correlation test was used to calculate the correlation between two numerical variables since the data did not have a normal distribution. Statistical significance was set at p = 0.05 for all cases. Statistical analyses were conducted using the IBM SPSS software package (Statistical Package for the Social Sciences for Windows, Version 21.0, Armonk, NY, IBM Corp.).

RESULTS

Demographic data, the R-OKT, and OAS scores are presented in Table I. The total R-OKT was 12.44 ± 5.95, and the total OAS was 10.57 ± 5.2. The participants' age, height, weight, body mass index (BMI), and disease duration were 57.71 ± 11.27 years; 159.98 ± 7.53 cm; 74.65 ± 14.29 kg; 29.21 ± 5.45; and 17.55 ± 13.0 years, respectively. The participants' clinical features, habits, history of osteoporosis are presented in Table II.

Table I: Demographics, OAS and R-OKT scores of the Rheumatoid arthritis patients

	Mean ± SD	Median (Min-Max)
Age	57.71 ± 11.27	57.5 (23 - 90)
Height	159.98 ± 7.53	160 (140 - 184)
Weight	74.65 ± 14.29	75 (45 - 135)
BMI	29.21 ± 5.45	28.89 (18.26 - 49.59)
Disease duration	17.55 ± 13.0	15 (0.5 - 60)
R-OKT Nutriton	10.78 ± 5.05	11.5 (0 - 20)
R-OKT Exercise	7.98 ± 4.56	9 (0 - 19)
R-OKT Total	12.44 ± 5.95	13 (0 - 25)
OAS Exercise	9.01 ± 3.16	9 (4 - 16)
OAS Bone Physiology	10.96 ± 3.96	10 (6 - 18)
OAS Preventive behaviors	15.84 ± 4.94	16.5 (7 - 27)
OAS Characteristics of osteoporosis	10.82 ± 3.76	11 (5 - 20)
OAS Risk Factrors	9.12 ± 3.47	8.5 (5 - 18)
OAS Total	10.57 ± 5.2	11 (0 - 21)

BMI, Body mass index R-OKT, revised osteoporosis knowledge test; OAS, osteoporosis awareness test

Table II: The clinical characteristics, and nutritional and exercise habits of the Rheumatoid arthritis patients

		n (%)
Education	illiterate	3 (2.7%)
	Primary school	53 (48.2%)
	Secondary school	13 (11.8%)
	High school	23 (20.9%)
	University	18 (16.4%)
Sex	Female	93 (84.6%)
	Male	17 (15.4%)
Sunbathing frequency	1-3 times a month	11 (10.0%)
	Once a week	13 (11.8%)
	2-3 times a week	15 (13.6%)
	Everyday	26 (23.6%)
	Almost never	45 (40.9%)
Source of information about osteoporosis	Family-friend	14 (12.7%)
	Newspaper-magazine	2 (1.8%)
	School	2 (1.8%)
	Healthcare institution	63 (57.3%)
	TV-radio-internet	29 (26.4%)
Osteoporosis treatment	Bisphosphonate	2 (1.8%)
	None	51 (46.4%)
	Calcium	9 (8.2%)
	D vitamin	46 (41.8%)
	Denosumab	2 (1.8%)
Consumption of dairy products	None	34 (30.9%)
	1-3 portion/day	73 (66.4%)
	≥3 portion/day	3 (27.3%)
Occupation	Retired	40 (36.4%)
	Worker	14 (12.7%)
	Civil servant	6 (5.5%)
	Unemployed	50 (45.5%)
Coffee	0 cups/day	54 (49.1%)
	1-3 cups/day	50 (45.5%)
	≥4 cups/day	6 (5.5%)
Have you ever been screened for osteoporosis		
	Yes	60 (54.5%)
	No	50 (45.5%)
Morning stiffness duration	<30 minutes	41 (37.3%)
	≥30 minutes	39 (35.5%)
	none	30 (27.3%)

		n (%)
Exercise frequency	Once aweek 14 (12.7%) 1-2 days/week 14 (12.7%) ≥3 days/week 15 (13.6%) None 67 (60.9%)	
Family history of fracture	Yes	7 (6.4%)
	No	103 (93.6%)
Alcohol consumption	None	108 (98.2%)
	1-3 times/week	2 (1.8%)
Smoking	Quit	19 (17.3%)
	Never	61 (55.5%)
	Active	30 (27.3%)
Chronic diease	Yes	91 (827%)
	No	19 (17.3%)
BDMARD	Yes	19 (17.3%)
	No	91 (82.7%)
Do you have regular follow-up for osteoporosis?	Yes	27 (24.5%)
	No	83 (5.5%)
History of fracture	Yes	36 (32.7%)
	No	74 (67.3%)
Leflunomide	Yes	19 (17.3%)
	No	91 (82.7%)
Methotrexate	Yes	42 (38.2%)
	No	68 (61.8%)
Nonsteroid anti-inflammatory drug	Yes	43 (39.1%)
	No	67 (60.9%)
Have you ever heard of osteoporosis?	Yes	110 (100%)
	No	0(0%)
Osteoporosis diagnosis	Yes	31 (28.2%)
	No	79 (71.8%)
Plaquenil	Yes	28 (25.5%)
	No	82 (74.5%)
Do you think you are at risk of osteoporosis?	Yes	36 (32.7%)
	No	74 (67.3%)
Salazopyrin	Yes	16 (14.5%)
	No	94 (85.5%)

BDMARD, Biological disease-modifying antirheumatic drug

When comparing age values with the R-OKT nutrition, exercise, and total scores, as well as the OAS risk factors, OAS characteristics of osteoporosis, and OAS total scores, a statistically significant positive correlation was observed. Conversely, when comparing weight values with the R-OKT nutrition, R-OKT exercise, R-OKT total scores, OAS bone physiology, and OAS total scores, a statistically significant negative correlation was observed. Additionally, when comparing BMI values with the R-OKT exercise, R-OKT total, and OAS total scores, a statistically significant negative correlation was also observed (Table III).

Table III: Correlation between rheumatoid arthritis patients' age, height, weight, BMI, disease duration and R-OKT, OAS scores

Parameter	Age		Height		Weight		BMI		Disease duration	
	r	p*	r	p*	r	p*	r	p*	r	p*
R-OKT Nutrition	0.212	**0.026**	-0.079	0.414	-0.228	**0.017**	-0.172	0.072	-0.004	0.964
R-OKT Exercise	0.217	**0.023**	-0.051	0.595	-0.247	**0.009**	-0.196	**0.041**	0.013	0.89
R-OKT Total	0.21	**0.028**	-0.052	0.587	-0.259	**0.006**	-0.204	**0.032**	0.013	0.896
OAS Bone physiology	0.047	0.628	-0.102	0.291	-0.212	**0.026**	-0.137	0.152	-0.022	0.823
OAS Preventive behaviors	0.104	0.277	0.005	0.957	-0.176	0.066	-0.146	0.129	0.07	0.465
OAS Risk Factrors	0.251	**0.008**	-0.085	0.378	-0.129	0.179	-0.079	0.413	0.083	0.387
OAS Exercise	0.032	0.74	-0.113	0.241	-0.175	0.067	-0.108	0.263	0.019	0.846
OAS Characteristics of osteoporosis	0.197	**0.039**	-0.171	0.074	-0.145	0.132	-0.02	0.837	0.028	0.775
OAS Total	0.218	**0.022**	-0.037	0.699	-0.272	**0.004**	-0.231	**0.015**	-0.02	0.839

**Spearman's Correlation Test BMI, body mass index; R-OKT, revised osteoporosis knowledge test; OAS, osteoporosis awareness test*

No significant difference was noted across the total and sub-scores of the R-OKT and OAS based on sex (Table IV). According to the R-OKT, university graduates had a notably greater level of knowledge than primary school graduates in both the exercise (p=0.002) and nutrition (p=0.002) subscales, and the total score (p=0.001). According to the OAS, university graduates had higher awareness levels than primary school graduates in the total score (p=0.001) and in the subscales of exercise (p=0.032), preventive behaviors (p=0.04), and the characteristics of osteoporosis (p=0.047) (Table V). The osteoporosis knowledge and awareness levels of participants according to their occupations are presented in Table VI. Participants with a history of fractures had a higher level of knowledge according to the R-OKT in the subscales of nutrition (p=0.044) and exercise (p=0.008), as well as in the total score (p=0.036), compared to those without a history of fractures. Additionally, individuals with a history of fractures exhibited greater awareness levels than those without, according to the total OAS score (p=0.047). No notable difference was observed between participants who have a family history of fractures and those without regarding osteoporosis knowledge level and awareness. Participants with regular osteoporosis follow-up had a higher level of knowledge according to the R-OKT in nutrition (p=0.024), exercise (p=0.011), and total score (p=0.014) compared to those without regular follow-up. Additionally, those with regular osteoporosis follow-up had higher awareness levels in all OAS values except for bone physiology. Participants using vitamin D had a higher level of knowledge according to the R-OKT in nutrition (p=0.005), exercise (p=0.006), and total score (p=0.002) compared to those not using any medications. Furthermore, those taking vitamin D demonstrated a greater level of awareness according to the OAS total score (p=0.003), in contrast to those who were not (Table VII).

Table IV: Comparison of OAS and R-OKT scores between sexes of rheumatoid arthritis patients

	Male (17)	Female (93)	P-value
	Median (Min–Max)	Median (Min–Max)	
R-OKT Nutrition	11 (0 - 20)	12 (0 - 20)	0.957(m)
R-OKT Exercise	19 (0 - 19)	9 (0 - 16)	0.781(m)
R-OKT Total	13 (0 - 25)	13 (0 - 23)	0.964(m)
OAS Exercise	9 (4 - 13)	9 (4 - 16)	0.745(m)
OAS Bone physology	11 (6 - 18)	10 (6 - 18)	0.914(m)
OAS Preventive behaviors	17 (7 - 24)	16 (7 - 27)	0.885(m)
OAS Characteristics of osteoporosis	11 (5 - 15)	11 (5 - 20)	0.272(m)
OAS Risk factors	8 (5 - 16)	9 (5 - 18)	0.904(m)
OAS Total	11 (0 - 21)	11 (0 - 20)	0.833(m)

(m) Mann Whitney U Test R-OKT, revised osteoporosis knowledge test; OAS, osteoporosis awareness test

Table V: Comparison of OAS and R-OKT scores between the educational level of rheumatoid arthritis patients

Education	Primary school (53)	High school (23)	Secondary school (13)	University (18)	P-value
	Mean ± SD or Median (Min–Max)	Mean ± SD or Median (Min–Max)	Mean ± SD or Median (Min–Max)	Mean ± SD or Median (Min–Max)	
R-OKT Nutrition	10 (0 - 20)	11 (0 - 18)	10 (4 - 20)	15 (8 - 20)	**0.002(k)**
R-OKT Exercise	6.83 ± 4.74	8.39 ± 4.09	7.46 ± 4.16	11.39 ± 3.27	**0.002(a)**
R-OKT Total	12 (0 - 23)	12 (0 - 22)	11 (5 - 23)	16.5 (9 - 25)	**0.001(k)**
OAS Exercise	8.43 ± 3.39	8.91 ± 3.0	9.38 ± 2.18	10.94 ± 2.69	**0.032(a)**
OAS Bone physiology	9 (6 - 18)	10 (6 - 18)	10 (6 - 17)	13.5 (6 - 18)	0.061(k)
OAS Preventive behaviors	15 (7 - 26)	16 (7 - 23)	17 (11 - 23)	19 (10 - 27)	**0.04(k)**
OAS Characteristics of osteoporosis	11 (5 - 20)	11 (5 - 15)	11 (8 - 16)	14 (7 - 19)	**0.047(k)**
OAS Risk factors	7 (5 - 18)	8 (5 - 15)	8 (5 - 15)	10 (6 - 16)	0.112(k)
OAS Total	11 (0 - 19)	11 (0 - 18)	9 (3 - 20)	15 (7 - 21)	**0.001(k)**

(k) Kruskal Wallis Test - (a) Anova F-test R-OKT, revised osteoporosis knowledge test; OAS, osteoporosis awareness test

Table VI: Comparison of OAS and R-OKT scores between occupation of rheumatoid arthritis patients

	Retired (40)	Worker(14)	Civil servant (6)	Unemployed(50)	P-value
	Mean ± SD or Median (Min–Max)	Mean ± SD or Median (Min–Max)	Mean ± SD or Median (Min–Max)	Mean ± SD or Median (Min–Max)	
R-OKT Nutriton	13 (0 - 19)	8 (0 - 14)	14.5 (11 - 20)	10 (0 - 20)	**0.001(k)**
R-OKT Exercise	9.45 ± 4.19	4.5 ± 3.8	11.33 ± 4.68	7.38 ± 4.39	**0.001(a)**
R-OKT Total	14.3 ± 5.57	8.29 ± 5.73	17.33 ± 5.05	11.52 ± 5.59	**0.001(a)**
OAS Exercise	9.68 ± 3.14	7.36 ± 3.13/	10.83 ± 2.86	8.72 ± 3.05	0.053(a)
OAS Bone Physiology	11 (6 - 18)	9 (6 - 15)	12.5 (9 - 18)	9 (6 - 18)	0.101(k)
OAS Preventive behaviors	17.25 ± 4.81	12.36 ± 5.17	18.17 ± 2.56	15.4 ± 4.7	**0.006(a)**
OAS Characteristics of osteoporosis	12.5 (5 - 19)	9 (5 - 14)	10.5 (7 - 15)	11 (5 - 20)	**0.039(k)**
OAS Risk Factors	9 (5 - 17)	6.5 (5 - 16)	9.5 (7 - 12)	8 (5 - 18)	**0.035(k)**
OAS Total	12.22 ± 4.91	7.07 ± 5.01	15.0 ± 4.34	9.7 ± 4.85	**0.001(a)**

(k) Kruskal Wallis Test - (a) Anova F-test R-OKT, revised osteoporosis knowledge test; OAS, osteoporosis awareness test

Table VII: Responses of rheumatoid arthritis patients' history of fracture, family history of fracture, regular follow-up of osteoporosis, treatment of osteoporosis

History of fracture	**Yes (36)**	**No (74)**	**P-value**
	Mean ± SD or Median (Min–Max)	**Mean ± SD or Median (Min–Max)**	
R-OKT Nutriton	12.17 ± 4.45	10.11 ± 5.21	**0.044(s)**
R-OKT Exercise	9.61 ± 3.89	7.19 ± 4.68	**0.008(s)**
R-OKT Total	14.14 ± 5.16	11.61 ± 6.16	**0.036(s)**
OKT Exercise	9 (4 - 16)	9 (4 - 16)	0.075(m)
OAS Bone physiology	11.5 (6 - 18)	10 (6 - 18)	0.178(m)
OAS Preventive behaviors	16.89 ± 4.6	15.32 ± 5.04	0.119(s)
OAS Characteristics of osteoporosis	12 (5 - 19)	10.5 (5 - 20)	0.214(m)
OAS Risk Factors	9 (5 - 16)	8 (5 - 18)	0.423(m)
OAS Total	12 (0 - 20)	10.5 (0 - 21)	**0.047(m)**
Family history of fracture	**Yes (7)**	**No (103)**	**P-value**
	Median (Min–Max)	**Median (Min–Max)**	
R-OKT Nutriton	14 (7 - 18)	11 (0 - 20)	0.311(m)
R-OKT Exercise	11 (4 - 15)	9 (0 - 19)	0.364(m)
R-OKT Total	17 (9 - 21)	13 (0 - 25)	0.401(m)
OAS Exercise	6 (6 - 13)	9 (4 - 16)	0.306(m)
OAS Bone physiology	9 (6 - 14)	10 (6 - 18)	0.46(m)
OAS Preventive behaviors	18 (8 - 22)	16 (7 - 27)	0.849(m)
OAS Characteristics of osteoporosis	8 (5 - 14)	11 (5 - 20)	0.169(m)
OAS Risk factors	9 (6 - 16)	8 (5 - 18)	0.975(m)
OAS Total	13 (7 - 17)	11 (0 - 21)	0.374(m)
Regular follow-up of osteoporosis	**Yes (27)**	**No (83)**	**P-value**
	Median (Min–Max)	**Median (Min–Max)**	
R-OKT Nutriton	13 (3 - 20)	11 (0 - 18)	**0.024(m)**
R-OKT Exercise	10 (1 - 19)	7 (0 - 15)	**0.011(m)**
R-OKT Total	16 (3 - 25)	13 (0 - 22)	**0.014(m)**
OAS Exercise	11 (4 - 14)	9 (4 - 16)	**0.004(m)**
OAS Bone physiology	12 (6 - 18)	10 (6 - 18)	0.09(m)
OAS Preventive behaviors	18 (8 - 24)	16 (7 - 27)	**0.018(m)**
OAS Characteristics of osteoporosis	13 (8 - 20)	10 (5 - 19)	**0.005(m)**
OAS Risk Factors	10 (5 - 18)	8 (5 - 16)	**0.007(m)**
OAS Total	13 (3 - 21)	11 (0 - 20)	**0.023(m)**

Treatment of osteoporosis	**No (51)**	**Calcium (9)**	**D vitamin (46)**	**P-value**
	Mean ± SD or Median (Min–Max)	**Mean ± SD or Median (Min–Max)**	**Mean ± SD or Median (Min–Max)**	
R-OKT Nutriton	9.08 ± 5.37	12.11 ± 3.1	12.33 ± 4.62	**0.005(a)**
R-OKT Exercise	6.49 ± 4.54	9.78 ± 3.35	9.22 ± 4.55	**0.006(a)**
R-OKT Total	10.31 ± 6.12	14.78 ± 3.6	14.24 ± 5.61	**0.002(a)**
OAS Exercise	9 (4 - 16)	9 (6 - 10)	11 (4 - 16)	0.097(k)
OAS Bone physiology	9 (6 - 18)	12 (7 - 16)	11.5 (6 - 18)	0.065(k)
OAS Preventive behaviors	16 (7 - 27)	15 (8 - 20)	17 (7 - 26)	0.28(k)
OAS Characteristics of osteoporosis	10 (5 - 20)	12 (8 - 18)	12.5 (5 - 16)	**0.031(k)**
OAS Risk Factors	7 (5 - 18)	9 (6 - 13)	9 (5 - 17)	0.101(k)
OAS Total	8.76 ± 5.37	12.22 ± 3.27	12.17 ± 4.92	**0.003(a)**

(a) Anova F-test - (k) Kruskal Wallis Test (m) Mann Whitney U Test (s) Student T-test R-OKT, revised osteoporosis knowledge test; OAS, osteoporosis awareness test

DISCUSSION

Based on the findings of this research, the osteoporosis knowledge levels and awareness of patients with RA were found to be low. Most of the participants did not know they were in the risk group. The data from this study highlighted that as the level of education increased, the osteoporosis knowledge and awareness levels also increased. Participants who had a previous history of fractures, were regularly monitored for osteoporosis, and used vitamin D, were found to have higher levels of osteoporosis knowledge and awareness. Additionally, participants' osteoporosis knowledge and awareness levels were directly related to age and inversely related to weight and BMI.

In the current research, the mean R-OKT score was found to be 12.44±5.95. In a study conducted with female patients followed in an orthopaedic clinic, the mean OKT score was 9.86.[18] In a study with healthier volunteers, who were younger and had a higher percentage of university graduates, the mean score was 12.5.[19] In a more recent study, the mean OKT scores for perimenopausal women were found to be 16.42, while for postmenopausal women, it was 15.74.[10] In another study involving patients with RA, the mean OKT score was 15.06±4.42.[11] These differences can be explained by variations in the age and education levels of the patient groups.

Different relationships with age have been identified in osteoporosis knowledge and/or awareness studies, conducted in different groups. There are studies showing that age and osteoporosis knowledge level are inversely proportional[9,20,21]. The osteoporosis knowledge levels for females in the 45–54 age group exceeded that of other groups in patients followed up in the orthopedic department[18]. In this study, the level of knowledge and awareness about osteoporosis was found to be positively correlated with age. This situation can be explained by the increased sensitivity to events that cause comorbidities, such as fractures, with increasing age.

Studies in the literature have shown that men have lower levels of knowledge and/or awareness about osteoporosis compared to women[19,22.] This result has been interpreted as potentially related to the perception that osteoporosis is a disease associated with women or the high prevalence of a positive family history of osteoporosis among female participants[19,22]. In this investigation, no notable differences were detected in the knowledge and awareness of osteoporosis between sexes, as reported by Aksoy et al[11]. This suggests that male patients with RA may be more sensitive to osteoporosis than those without RA.

In this study, it was observed that as the level of education increased, the levels of osteoporosis knowledge and awareness also increased, which was consistent with the literature[9,22-24]. Educational programs are also very important to increase knowledge about osteoporosis, as these can help participants both increase their knowledge and integrate this information into their daily lives. A study implemented a three-month program aimed at improving bone health in postmenopausal women. This program included group education, exercises, calcium, and vitamin D supplementation, as well as individual health counselling. Compared with a control group, participants in the program demonstrated positive changes in nutrition and exercise, and their knowledge levels regarding osteoporosis increased[25]. A training program on osteoporosis was implemented for South Asian women and interviews conducted two weeks after the training, showed that the women's knowledge levels had significantly increased compared to before the training[26]. This trend highlights the importance of educational initiatives in promoting understanding of osteoporosis and its prevention. There are also studies showing that the level of knowledge about osteoporosis increases with education, but awareness does not change[10,11,18]. Overall, while education plays a critical role in enhancing knowledge about osteoporosis, it is essential to create strategies that also foster awareness.

Although previous research has found no connection concerning previous fractures and awareness or knowledge levels of osteoporosis,[21] in one study conducted with patients with radial fractures over 45, it was stated that 40.8% of the participants had osteoporosis awareness[22]. Biri et al. have also found that women diagnosed with osteoporosis provided correct answers to the question "What

is osteoporosis?" at a significantly higher rate, compared to those who had not received a diagnosis[27]. The data from this study also pointed out that participants who had previously experienced a fracture, were regularly monitored for osteoporosis, or were receiving osteoporosis treatment had higher levels of knowledge and awareness about osteoporosis. Similar to the studies by Aksoy et al. and Akyol et al. in our study, family history did not affect the levels of osteoporosis awareness and knowledge[10,11].

As well in this study, no connection was identified between disease duration and osteoporosis knowledge and awareness levels. In the study of Aksoy et al. similar to the present study R-OKT was not found to be related to disease duration; but osteoporosis awareness was found to be positively correlated with disease duration[11].

The high cost of treating osteoporotic fractures and the disability they cause in patients, necessitates the development of prevention methods for osteoporosis. Nutrition and lifestyle choices that positively affect bone metabolism play a crucial role in preventing osteoporosis. In this context, a diet rich in calcium and vitamin D, consistent exercise, along with refraining from smoking and limiting alcohol intake, can greatly decrease the risk of osteoporosis[28]. Furthermore, increasing awareness about osteoporosis helps individuals understand their risks and take preventive measures[29].

According to the results of this study, most of the participants consumed 1-3 servings of dairy products per day and less than half of them took vitamin D. However, a significant proportion rarely sunbathed and most of them did not do any exercise. The findings of the present research show that RA patients have limited knowledge about the protective role of nutrition and particularly exercise in osteoporosis. Additionally, the knowledge and awareness results show that scores related to risk factors and exercise are quite low. Based on these results, it is clear that there is a need to increase awareness, in particular with regard to exercise, in this patient population. Kinesiophobia may also have had an impact on these results in RA[30]. However, it has been found that in the RA patient group, osteoporosis is not given enough attention at check-ups, whereas patients who are already being monitored for osteoporosis tend to have higher levels of knowledge and awareness.

In this study, the leading source of information on osteoporosis was health care institutions, followed by television, radio, and the Internet. While the most common source of information in previous studies[9,23,24] was the press, the difference in this study can be explained by the frequent visits to healthcare facilities in the RA patient group. In another study, it was emphasized that women who reported being informed about osteoporosis had higher knowledge scores regarding the condition. In this study, it was noted that a significant proportion of the information sources (59.3%) were healthcare professionals. The effectiveness of this provided information highlights the importance of education and suggests that when the information source is healthcare professionals, it may be more effective[18]. According to the study by Kurt et al. and Sahin et al. patients in all education groups stated that they would most like to receive education from a healthcare institution[9,22]. Based on these studies, we believe that accurate and comprehensive information about osteoporosis provided by healthcare professionals, will help patients to better understand their condition. Information enables patients to manage their expectations and participate more actively in their treatment process. The role of healthcare professionals is critical in providing information and support that meets the needs of patients.

This study had several limitations. The cross-sectional approach limited the potential to identify causality between the variables, relying on a single data collection point. The comparison with healthy-matched individuals would have strengthened the hypothesis. Future investigations with larger cohorts and long-term monitoring are essential to assess knowledge and awareness levels in this population.

CONCLUSION

This research's results indicate that RA patients have low levels of knowledge and awareness regarding osteoporosis. Furthermore, a significant proportion of RA patients appear to be unaware of their risk of developing osteoporosis. Patient education programs should be organized notably for RA patients to reduce the incidence of osteoporosis and the morbidity and mortality that may occur due to osteoporosis. Regular osteoporosis follow-up in the RA patient group can also help prevent the occurrence of devastating complications, such as fractures, by increasing the awareness and knowledge levels of patients.

Ethical Approval: The Ethics Committee of the University granted approval for the study (Ethical Approval Date: 18/09/2024, Number: 875).

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REFERENCES

1. Ensrud KE, Crandall CJ. Osteoporosis. Ann Intern Med 2024; 177: ITC1-ITC16.

2. Nguyen NV, Dinh TA, Ngo QV, Tran VD, Breitkopf CR. Awareness and knowledge of osteoporosis in Vietnamese women. Asia Pac J Public Health 2015; 27: NP95-NP105.

3. Yavuz D. Osteoporoz: Epidemiyoloji, Klinik ve Tanı. Turkiye Klinikleri Journal of Endocrinology Special Topics 2011; 4: 28-32.

4. Tuzun S, Eskiyurt N, Akarırmak U, et al. Incidence of hip fracture and prevalence of osteoporosis in Turkey: the FRACTURK study. Osteoporos Int 2012; 23: 949-55.

5. Baker R, Narla R, Baker JF, Wysham KD. Risk factors for osteoporosis and fractures in rheumatoid arthritis. Best Pract Res Clin Rheumatol 2022; 36: 101773.

6. Jin S, Hsieh E, Peng L, et al. Incidence of fractures among patients with rheumatoid arthritis: a systematic review and meta-analysis. Osteoporos Int 2018; 29: 1263-75.

7. Çakırca G, Batmaz İ, Mete N, et al. Romatoid artritli hastalarda kemik mineral yoğunluğu ile RANKL, osteoprotegerin ve katepsin-K düzeyleri arasındaki ilişki. Diclemedj 2012; 39 :479-84.

8. Hien VT, Khan NC, Mai LB, et al. Effect of community-based nutrition education intervention on calcium intake and bone mass in postmenopausal Vietnamese women. Public Health Nutr 2009; 12: 674-9.

9. Kurt EE, Koçak FA, Tuncay F, Erdem HR, Kıranatlıoğlu F. Knowledge Level and Awareness about Osteoporosis among Risk Group of Rural Women. Turk J Osteoporos 2015; 21: 63-8.

10. Akyol Y, Ulus Y, Bilgici A, Kuru Ö. Premenopozal ve Postmenopozal Kadınlarda Osteoporoz Bilgi ve Farkındalık Düzeyinin Karşılaştırılması. Turk J Osteoporos 2020; 26: 10-8.

11. Tomay Aksoy Ö, Kutluk Ö, Sezer İ. Osteoporosis knowledge and awareness among rheumatoid arthritis patients: A cross-sectional controlled study. Arch Rheumatol 2024; 39: 411-8.

12. Aletaha D, Neogi T, Silman AJ, et al. 2010 Rheumatoid arthritis classification criteria: An American College of Rheumatology/European League Against Rheumatism collaborative initiative. Arthritis Rheum 2010; 62: 2569-81.

13. Kim K, Horan M, Gendler P. Osteoporosis knowledge tests, osteoporosis health belief scale, and osteoporosis self-efficacy scale. Grand Valley State University, Allendale, MI. 1991.

14. Gendler PE, Coviak CP, Martin JT, et al. Revision of the osteoporosis knowledge test: reliability and validity. Western J Nurs Res 2015 ;37 :1623-43.

15. Atalay NŞ, Akkaya N, Sahin F. The psychometric properties of the Turkish version of revised 2011-osteoporosis knowledge test. Turk Osteoporoz Dergisi 2015; 21: 127-31.

16. Choi E, Kim J, Chung M, Hwang K. Development of an osteoporosis awareness scale for women. J Korea Acad Nurs 2008; 38: 813-21.

17. Aktürk SO, Meseri R, Özentürk MG. The psychometric property evaluation of the Turkish version of the osteoporosis awareness scale. Turk J Osteoporos 2021; 27: 151-8.

18. Öztürk A, Sendir M. Evaluation of knowledge of osteoporosis and self-efficacy perception of female orthopedic patients in Turkey. J Nurs Healthcare Chronic Illnes 2011; 3: 319-28.

19. Altın E, Karadeniz B, Türkyön F, et al. Kadın ve Erkek Yetişkinlerde Osteoporoz Bilgi ve Farkındalık Düzeyinin Karşılaştırılması. Türk Osteoporoz Dergisi 2014; 20: 98-103.

20. Arslan SA, Daşkapan A, Atalay DK, Tüzün EH, Korkem D. Kırıkkale İlinde Yaşayan Kadınların Osteoporoz Bilgi Düzeyi. Turk J Physiother Rehabil 2015; 26: 120-7.

21. Kavak SK, Aktekin L, Kavak EE, Sevingül B, Önoğul M. Osteoporosis Awareness and Knowledge in Postmenopausal Breast Cancer Survivors. Turk J Osteoporos 2024; 30: 30-6.

22. Şahin E, Dilek B, Baydar M, Kösehasanoğulları M, Ucku R, Öncel S. Awareness of osteoporosis and its related factors after distal radius fractures in patients aged 45 years and older. Türkiye Fiziksel Tıp ve Rehabilitasyon Dergisi 2013; 59: 52-6.

23. Yeap SS, Goh EM, Das Gupta E. Knowledge About Osteoporosis in a Malaysian Population. Asia Pac J Public Health 2010; 22: 233-41.

24. Puttapitakpong P, Chaikittisilpa S, Panyakhamlerd K, Nimnuan C, Jaisamram U, Taechakraichana N. Inter-correlation of knowledge, attitude, and osteoporosis preventive behaviors in women around the age of peak bone mass. BMC Women's Health 2014; 14: 35.

25. Oh EG, Yoo JY, Lee JE, Hyun SS, Ko IS, Chu SH. Effects of a three-month therapeutic lifestyle modification program to improve bone health in postmenopausal Korean women in a rural community: A randomized controlled trial. Res Nurs Health 2014; 37: 292-301.

26. Shakil A, Gimpel NE, Rizvi H, et al. Awareness and prevention of osteoporosis among South Asian women. J Community Health 2010; 35: 392-7.

27. Biri A, Albayrak S. Onbeş yaş ve üzeri kadınların osteoporoz konusundaki bilgileri. MN-Klinik Bilimler Doktor 2005; 11: 444-50.

28. Clinician's Guide to Prevention and Treatment of Osteoporosis. National Osteoporosis Foundation (USA) Guidelines. Available from: http://www.nof.org. Accessed October 2024.

29. Park KS, Yoo JI, Kim HY, Jang S, Park Y, Ha YC. Education and exercise program improves osteoporosis knowledge and changes calcium and vitamin D dietary intake in community dwelling elderly. BMC Public Health 2017; 17: 966.

30. Baysalhan Öztürk İ, Garip Y, Sivas F, Parlak Özden M, Bodur H. Kinesiophobia in rheumatoid arthritis patients: Relationship with quadriceps muscle strength, fear of falling, functional status, disease activity, and quality of life. Arch Rheumatol 2021; 36: 427-34.