Arch Rheumatol 2024;39(3):411-418
doi: 10.46497/ArchRheumatol.2024.10171

ORIGINAL ARTICLE

Osteoporosis knowledge and awareness among rheumatoid arthritis patients: A cross-sectional controlled study

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Received: February 17, 2023
Accepted: December 06, 2023
Published online: July 02, 2024

Citation: Tomay Aksoy Ö, Kutluk Ö, Sezer İ. Osteoporosis knowledge and awareness among rheumatoid arthritis patients: A cross-sectional controlled study. Arch Rheumatol 2024;39(3):411-418. doi: 10.46497/ArchRheumatol.2024.10171.

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ABSTRACT

Objectives: The aim of this study was to investigate the levels of knowledge and awareness of osteoporosis (OP) in patients with rheumatoid arthritis (RA).

Patients and methods: The cross-sectional study included 100 RA patients (26 males, 74 females; mean age: 51.3±11.4 years; range, 28 to 67 years) who had not been diagnosed with OP and a control group of 50 healthy subjects (16 males, 34 females; mean age: 53.2±11.1 years; range, 29 to 70 years) between February 2022 and June 2022. The demographic data of age, sex, and education level of all the participants were recorded. Disease duration and the drugs used were recorded for the RA patients. The revised Osteoporosis Knowledge Test and the Osteoporosis Health Belief Scale questionnaires were completed by the participants.

Results: There was no significant difference determined between the RA patients and the control group in OP knowledge levels. A positive correlation was determined between education level and OP knowledge level and between disease duration and OP awareness level. RA patients with a family history of OP, those in the postmenopausal period, and those using biological disease-modifying drugs thought they were at risk of OP at a higher rate.

Conclusion: While the levels of knowledge and awareness of OP were determined to be similar in the RA patients and the control group, the vast majority of RA patients did not know that they were at risk of developing OP. In addition, when the data obtained in this study are taken into consideration, there appears to be a need for health strategies such as educational programs and informing RA patients about OP.

Keywords: Awareness, knowledge, osteoporosis, rheumatoid arthritis.

Osteoporosis (OP) is a systemic disease characterized by low bone mass and deteriorated bone microarchitecture, which can lead to increased bone fragility and fractures.[1] Rheumatoid arthritis (RA) causes local and systemic bone loss.[2] The etiology of increased fracture risk in RA is multifactorial and increases with disease duration, decreased mobility, chronic glucocorticoid use, low body mass index, and anti-citrullinated protein antibody positivity.[3] Furthermore, inflammatory cytokines, such as tumor necrosis factor, interleukin (IL)-1, and IL-6 negatively affect osteoblastogenesis and increase osteoclastogenesis.[4]

Approximately one-third of RA patients are diagnosed with OP after menopause, and the frequency of OP at every age in RA is two-fold higher than in the general population.[5] When age and sex-matched healthy subjects are compared, there is a two-fold greater risk of fragility fractures (vertebral and nonvertebral) associated with OP in RA patients.[6] In a study that compared RA patients with a control group on osteoporotic fracture risk, the clinical osteoporotic fracture risk was determined to be increased by 1.4-fold in male RA patients and 1.5-fold in female RA patients.[6]

Many lifestyle-related risk factors can cause the development of OP, such as insufficient calcium intake, lack of exercise, smoking, and alcohol consumption.[7] Lifestyle changes such as limiting smoking and alcohol consumption, weight-bearing exercises, and a diet with sufficient calcium and

vitamin D can decrease the fracture risk or slow down the progression of OP.[8,9]

There are several studies in the literature that have investigated the level of OP knowledge and awareness in different diseases and patient populations. The aim of the current study was to investigate the level of knowledge and awareness of OP in RA patients. To the best of our knowledge, this is the first study in the literature on this subject in the RA patient population.

PATIENTS AND METHODS

The cross-sectional study was conducted with RA patients and age- and sex-matched healthy controls between February 2022 and June 2022. All patients with RA fulfilled the 2010 American College of Rheumatology/European Alliance of Associations for Rheumatology classification criteria for RA.[10] The inclusion criteria for RA were not having been diagnosed with OP according to the previous bone density scan and having sufficient cognitive functions to be able to complete the questionnaires. The study included 100 RA patients who presented at the rheumatology department (26 males, 74 females; mean age: 51.3±11.4 years; range, 28 to 67 years) and 50 healthy control subjects (16 males, 34 females; mean age: 53.2±11.1 years; range, 29 to 70 years). The demographic data of age, sex, and education level of all the study participants were recorded. Education level was categorized as primary school, middle school, high school, and further education. Two subgroups were formed of those who had and had not completed basic education (<12 years and ≥12 years).

The participants were questioned about the consumption of milk and dairy products, coffee, and meat, whether they had entered menopause, the level of physical activity, and familial history of OP, and they were asked the questions, "Do you know what OP is?" and "Do you think you are at risk of OP?" The consumption of milk and dairy products was determined in three categories according to the portions consumed (one portion= one glass of milk, one cup of yogurt, or two slices of cheese): no dairy products consumed, one to three portions per day, or more than three portions per day. Meat consumption was defined as follows: none, once a week, two to four times a week, and more than five times a week. Coffee consumption was defined as follows: none, one to three cups a day, and more than four cups a day. The physical activity level was defined by questioning how many times per week they walked for a minimum of 30 min, cycled, or performed resistive exercises. The responses were classified as occasional exercise (≤1 day/week), little exercise (1-2 days/week), and regular exercise (≥3 days/week).

Disease duration and the drugs used were recorded for the RA patients. The drugs used in the treatment of RA were classified as conventional synthetic disease-modifying drugs (csDMARDs) and biological disease-modifying drugs (bDMARDs).

The revised Osteoporosis Knowledge Test (OKT) and the Osteoporosis Health Belief Scale (OHBS) questionnaires were completed by all participants. The OKT consists of 32 items in two subscales: nutrition (Items 1-11 and 18-32) and exercise (Items 1-17 and 30-32). The nutrition subscale has 26 items, the exercise subscale has 20 items, and 14 items are common to both subscales. In Items 1-11, the response options are "the likelihood of OP is low," scored as 1 point if correct, "the likelihood of osteoporosis is high," scored as 2 points if correct, and "there is no relationship with the development of OP," scored as 0 points if correct, and "I do not know," scored as 0 points. The total score can range from 0 to 32 points. Validity and reliability studies of the OKT in Turkish were performed by Atalay et al.[11] Higher scores reflect greater knowledge of OP.

The OHBS consists of 42 items in seven subscales of susceptibility (Items 1-6), seriousness (Items 7-12), the benefits of exercise (Items 13-18), the benefits of calcium intake (Items 19-24), barriers to exercise (Items 25-30), barriers to calcium intake (Items 31-36), and health motivation (Items 37-42). The questionnaire was developed by Kim et al.[12] to measure the health beliefs of individuals related to OP, and validity and reliability studies of the Turkish version have been conducted.[13] Each item is scored from 0 to 5 points, where 0 represents "I completely disagree," and 5 represents "I completely agree." The total for each subscale ranges from 6 to 30

Table 1. The demographic data, clinical characteristics, and nutritional and exercise habits of the RA patients and the control group

	RA patients (n=100)					Control group (n=50)					
Variables	n	%	Mean±SD	Median	IQR	n	%	Mean±SD	Median	IQR	*p*
Age (year)			51.3±11.4					53.2±11.1			0.323
Sex											0.440
Female	74	74				34	68				
Male	26	26				16	32				
Menopause	48	64.9				23	67.6				0.777
Place of residence											0.999
City centre	62	62				31	62				
Town	38	38				19	38				
Employment status											**0.008**
Manual worker	26[a]	26				24[b]	48				
Unemployed	51[a]	51				12[b]	24				
Retired	17[a]	17				12[a]	24				
Clerical worker	6[a]	6				2[a]	4				
Education level											0.060
Primary school	39	39				10	20				
Middle school	21	21				14	48				
High school	30	30				23	46				
Further education	10	10				3	6				
Basic education (year)											0.163
Basic education not completed (<12)	60	60				24	48				
Basic education completed (≥12)	40	40				26	52				
Do you know what osteoporosis is?											0.106
Yes	46	46				30	60				
No	54	54				20	40				
Do you think you are at risk of osteoporosis?											0.461
Yes	44	44				19	38				
No	28	28				19	38				
I don't know	28	28				12	24				
Family history	21	21				9	18				0.665
Consumption of dairy products											**0.024**
None	13[a]	13				6[a]	12				
1-3 portions/day	79[a]	79				32[b]	64				
>3 portions/day	8[a]	8				12[b]	24				
Meat consumption											0.350
None	12	12				3	6				
1 time/week	43	43				20	40				
3-4 times/week	37	37				19	38				
>5 times/week	8	8				8	16				
Coffee consumption											**<0.001**
None	42[a]	42				13[b]	26				
1-3 cups/day	55[a]	55				23[a]	46				
>3 cups/day	3[a]	3				14[b]	28				
Physical activity											0.518
None	35	35				19	38				
Occasional	23	23				12	24				
Little	16	16				10	20				
Regular	23	23				6	12				
Every day	3	3				3	6				
Disease duration (year)				7.5	2-13				-	-	-
Drugs used											-
csDMARD	76	76				-	-				
bDMARD	24	24				-	-				

RA: Rheumatoid arthritis; SD: Standard deviation; csDMARD: Classic synthetic disease-modifying antirheumatic drug; bDMARD: Biological disease-modifying antirheumatic drug; Independent t-test, Pearson chi-square test. The same letters in a row denote no statistically significant difference.

points to give an overall total score in the range of 42 to 210 points. Higher points indicate a higher awareness of OP.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 23.0 software (IBM Corp., Armonk, NY, USA). The normality of the data was tested with the Shapiro-Wilk test. Descriptive statistics were summarized as frequency (n), percentage (%), mean, standard deviation, median, and interquartile range (25-75th percentile). The Mann-Whitney U test and the independent t-test were used for nonparametric and parametric comparisons of numeric data between the two independent groups, respectively. The Pearson chi-square test was used to determine the relationship between categorical variables. Post hoc analysis was performed using Bonferroni correction. The Spearman correlation test was used to determine the association between scale scores and the disease duration. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

The demographic data, clinical characteristics, and nutritional and exercise habits of the RA patients and control group are shown in Table 1. There was no significant difference between the RA patients and the control group in OKT exercise, OKT nutrition, OKT total, and OHBS total points (Table 2).

In RA patients, postmenopausal females thought that they were more at risk of OP than premenopausal females (p=0.006). Of the RA patients with a family history of OP, 76.2% thought they were at risk of OP, and this rate was 35.4% for those with no family history of OP. The difference between the groups was determined to be statistically significant (p=0.001, Table 3).

There was no significant difference in OKT and OHBS scores of RA patients according to family history and sex. RA patients using bDMARDs had a higher OHBS motivation score than those using csDMARD, and it was determined that they thought they were riskier for OP (p=0.032 and p=0.009, respectively).

Rheumatoid arthritis patients with a higher level of education (≥12 years) were determined to have significantly higher OKT exercise, nutrition, and total scores compared to those who had no basic education (p<0.001 for all).

A positive correlation was determined between education status and OKT nutrition

Table 2. OKT and OHBS scores of the RA patients and the control group

	RA patients (n=100)			Control group (n=50)			
Scales	Mean±SD	Median	IQR	Mean±SD	Median	IQR	*p*
OKT							
Exercise	9.37±3.27			9.44±3.15			0.901
Nutrition	12.19±3.67			12.18±4.12			0.988
Total	15.06±4.42			15.44±4.73			0.629
OHBS							
Susceptibility		21	15.5-27		20	14-22	0.058
Seriousness		22	16-25		21	15-28	0.865
Benefits of exercise		26	24-29		28	22-29	0.809
Benefits of calcium intake		24	22-29		28	22-30	0.135
Barriers to exercise		16	12-20		13	11-16	**0.001**
Barriers to calcium intake		13.5	10-17		12	10-15	0.233
Health motivation		24	22-27		24	22-29	0.448
Total		146	131-163.5		141.5	127-156	0.119

OKT: Osteoporosis Knowledge Test; OHBS: Osteoporosis Health Belief Scale; SD: Standard deviation.

Table 3. Responses of rheumatoid arthritis patients to the question "Do you think you are at risk of osteoporosis?"

	Yes		No		I don't know		
	n	%	n	%	n	%	*p**
Menopause							**0.006**
Premenopausal	10	38.5	11	42.3	5	192	
Postmenopausal	25	52.1	5	10.4	18	37.5	
Family history							**0.001**
Yes	28	35.4	28	35.4	23	29.1	
No	16	76.2	0	0	5	23.8	
Drugs used							**0.009**
csDMARD	27	35.5	25	32.9	24	31.6	
bDMARD	17	70.8	3	12.5	4	16.7	

csDMARD: Classic synthetic disease-modifying antirheumatic drug; bDMARD: Biological disease-modifying antirheumatic drug; * Pearson chi-square test.

Table 4. Correlation between RA patients' disease duration and educational status and scale scores

	Disease duration		Educational status	
Scales	r	*p*	r	*p**
Osteoporosis Knowledge Test				
Exercise	0.172	0.087	0.167	0.097
Nutrition	0.091	0.368	0.322	**0.001**
Total	0.154	0.127	0.323	**0.001**
Osteoporosis Health Belief Scale				
Susceptibility	0.223	**0.026**	0.176	0.079
Seriousness	0.199	**0.047**	-0.05	0.960
Benefits of exercise	0.145	0.151	0.147	0.145
Benefits of calcium intake	0.165	0.101	0.166	0.098
Barriers to exercise	0.011	0.911	-0.189	0.060
Barriers to calcium intake	0.004	0.970	-0.144	0.154
Health motivation	0.234	**0.019**	0.045	0.585
Total	0.224	**0.025**	0.047	0.568

RA: Rheumatoid arthritis; * Spearman correlation test.

(r=0.322, p=0.001) and OKT total scores (r=0.323, p=0.001). In RA patients, significant positive correlations were determined between disease duration and OHBS susceptibility (r=0.223, p=0.026), seriousness (r=0.199, p=0.047), motivation (r=0.234, p=0.019), and OHBS total score (r=0.224, p=0.025; Table 4).

DISCUSSION

Osteoporosis is one of the most frequent complications of RA and increases the risk of fracture in RA patients by two-fold compared to the general population.[6,14] Although there are studies in the literature on the levels of OP

knowledge and awareness in different patient populations, there is no study that investigated OP knowledge and awareness levels in RA patients.

In this study, OP knowledge and awareness levels and the rates of thinking that there is a risk of OP were similar between RA patients and the control group. It had been expected that the RA patients would have greater OP sensitivity. RA disease duration increased OP awareness, but no relation was found with OP knowledge level. These results could be attributed to RA patients not being sufficiently informed about the complications of the disease or patients not showing the required level of participation in treatment.

Increasing awareness and knowledge about OP in RA patients can also reduce negative consequences, such as physical disability and fractures.[8,9] In a randomized controlled study in South Korea, a three-month therapeutic lifestyle changes program, including group education, exercises, calcium, and Vitamin D supplementation with individual health counseling, was applied to postmenopausal females to improve bone health. Compared to a control group, those included in the program showed positive lifestyle changes in nutrition and exercise, and the levels of OP knowledge increased.[15] The current study findings showed that while the level of education increased the level of OP knowledge, there was no relationship with the level of awareness. In contrast to expectations, an increase in education level did not increase OP awareness, which could be due to patients not knowing that OP is a complication of RA.

Patients at risk of OP should be included in a structured exercise program that includes walking, weight training, balance exercises, posture, and flexibility to prevent falls that can cause fractures and increase bone mineral density.[16] In a study of both males and females aged >65 years, bone mineral density was determined to increase by 1.8% and 1.4%, respectively, with a 25% increase in daily step count.[17] In the current study, approximately 75% of the RA patients did not exercise regularly and had a higher perception of barriers to exercise compared to the control group. Systemic inflammation can cause increased disability by leading to pain and damage in the joints. Furthermore, kinesiophobia is common in RA patients.[18]

A well-balanced diet plays an important role in preventing and effectively treating OP. Daily calcium intake of 800 to 1200 mg and 800 to 1500 IU cholecalciferol is recommended for the population at high risk of OP, such as postmenopausal females and males aged >50 years.[19,20] Daily adequate protein intake between 1.0 and 1.2 g/kg minimizes bone loss and provides better functional recovery after fracture. However, high protein intake (>2 g/kg) can affect the calcium metabolism by decreasing intestinal calcium absorption or increasing urinary calcium excretion.[21] Despite there being no high protein and caffeine intake in the RA patients of the current study, daily milk and dairy product consumption were determined to be extremely low. These findings indicated the need to increase the awareness of RA patients about primary preventative strategies against OP, such as diet and patient-specific exercise programs.

In RA patients, although postmenopausal females thought they were more at risk for OP than premenopausal females, the knowledge and awareness levels of the two groups were similar. The reason for the greater sensitivity about OP of postmenopausal patients could be the perception of OP in association with menopause in the general population. Similar to the results of the current study, Akyol et al.[22] found that the level of OP knowledge and awareness was similar in both postmenopausal and premenopausal female patients.

Patients using bDMARDs thought that they were at risk of OP at a higher rate than patients using csDMARDs, and the motivation scores related to OP awareness were determined to be higher in these patients. Characteristics, such as the injectable application form of bDMARDs and the need for closer follow-up, could be the reason for the greater awareness related to the disease of patients using these drugs.

The presence of a family history of OP increases the risk of developing OP approximately two-fold.[23] In our study, RA patients with a family history thought that they had a higher risk of OP compared to RA patients without a family history, while their OP knowledge and awareness levels were similar. Therefore, it can

be expected that patients with a family history will be more sensitive to the subject of OP. In a study that investigated the level of OP knowledge of perimenopausal females, no difference was determined between those with and without a family history of OP in the level of OP knowledge, but those with a family history thought that they were at greater risk compared to those without a family history, similar to our study.[24]

There were some limitations to this study. The effect of regular follow-up on the knowledge and awareness levels could not be standardized and discounted due to the cross-sectional design. Moreover, the number of patients was relatively low, and further studies with larger sample sizes are required to evaluate the levels of knowledge and awareness of this population.

In conclusion, the results of this study demonstrated that the levels of OP knowledge and awareness of RA patients were no higher than those of the healthy control subjects, and a significant proportion of the RA patients were not aware that they were at risk of developing OP. The prevention of OP in RA patients, early diagnosis, and the prevention of complications, such as fractures, will reduce OP-related morbidity, mortality, and healthcare costs. Therefore, there is a need for healthcare strategies such as information and educational programs that will increase OP knowledge and awareness in this patient group.

Ethics Committee Approval: The study protocol was approved by the Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (date: 16.02.2022, no: KAEK-30), and the study was performed according to the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from each patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept: Ö.T.A., Ö.K., İ.S.; Data collection, writing article, analysis and/or interpretation, literature review: Ö.T.A., Ö.K.; Critical review: İ.S.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

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