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Is There an Effect of Pain and Radiological Stage on Quality of Life and Sleep in Patients with Osteoarthritis?

Osteoartritli Hastalarda Ağrı ve Radyolojik Evrenin Yaşam Kalitesi ve Uyku Üzerine Etkisi Var mı?

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ABSTRACT Objective: The aim of this cross-sectional study is to evaluate the effect of pain and radiological grade on quality of life and sleep in patients with knee osteoarthritis (OA). **Material and Methods:** Patients with OA who admitted to the outpatient clinics of Physical Medicine-Rehabilitation and Family Medicine at Gaziosmanpaşa Training and Research Hospital between August 2018 and November 2018 were included in this search. A health interview sharing demographic variables, Brief Pain Inventory Short Form scale (BPI), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Pittsburgh Sleep Quality Index (PSQI), OsteoArthritis Knee and Quality of Life Scale in the Lower Legs (OAKHQOL) scales were used to collect data. **Results:** One hundred and fifty-one OA patients (127 women, 24 men; mean age±SD: 60.14±8.95 years) had knee pain correlated with radiological grade (p=0.004; r=0.234). Poor sleep quality was detected in all participants based on PSQI score. Despite the radiological grade were related to pain of WOMAC (p<0.001 r=-0.322) and physical activity (p=0.014 r=-0.200) of OAKHQOL, sleep quality was not (p=0.077 r=0.144). The pain, stiffness, and disability scores of the WOMAC scale were significantly higher in radiologically Grade 4 cases than in others (p=0.004, p=0.023, p=0.001). There was no difference in the radiological grade for BPI's pain subscales (pain severity and pain interference subscale; p=0.538 p=0.627, respectively). **Conclusion:** Both WOMAC and BPI scales have shown that pain impaired life quality and sleep. Nevertheless, the BPI pain subscale was not associated with radiological grade, in contrast to the increased radiological grade-related pain in WOMAC and OAKHQOL. This result shows that the BPI scale might be limited to evaluate OA pain.

Keywords: Osteoarthritis; pain; sleep; quality of life

ÖZET Amaç: Bu kesitsel çalışmanın amacı, diz osteoartritli (OA) hastalarda ağrı ve radyolojik evrenin yaşam kalitesi ve uyku üzerindeki etkisini değerlendirmektir.**Gereç ve Yöntemler:** Araştırmaya Ağustos 2018 ile Kasım 2018 tarihleri arasında Gaziosmanpaşa Eğitim ve Araştırma Hastanesi'nin Fiziksel Tıp-Rehabilitasyon ve Aile Hekimliği polikliniklerine başvuran OA hastaları dâhil edildi. Katılımcılara, demografik değişkenler ile Kısa Ağrı Envanteri [Brief Pain Inventory Short Form scale (BPI)], Western Ontario and McMaster Universiteleri Osteoartrit İndeksi (WOMAC), Pittsburgh Uyku Kalite İndeksi (PSQI), Diz OA Yaşam Kalitesi Ölçeği [OsteoArthritis Knee and Quality of Life Scale in the Lower Legs (OAKHQOL)] formlarını içeren bir sağlık görüşmesi uygulandı. **Bulgular:** Yüz elli bir OA hastasında (127 kadın, 24 erkek; ortalama yaş±SS: 60,14±8,95 yıl) radyolojik evre ile ilişkili diz ağrısı vardı. PSQI puanına göre tüm katılımcıların uyku kalitesi kötü düzeyde saptandı. Radyolojik evre, WOMAC'daki ağrı (p<0.001 r=-0.322) ve OAKHQOL'deki fiziksel aktivite (p=0.014 r=-0.200) ile ilişkili olmasına rağmen uyku kalitesi ile ilişkili değildi (p=0.077 r=0.144). WOMAC ölçeğinin; ağrı, sertlik, özürlülük puanları radyolojik olarak Evre 4 olan olgularda diğerlerine göre anlamlı olarak yüksekti (p=0.004, p=0.023, p=0.001). BPI'nın ağrı alt ölçekleri için radyolojik derece açısından fark yoktu (ağrı şiddeti ve ağrı interferansı alt ölçeği; sırasıyla p=0.538 p=0.627). **Sonuç:** Hem WOMAC hem de BPI ölçekleri, ağrının yaşam kalitesini ve uykuyu bozduğunu göstermiştir. Yine de BPI ağrı alt ölçeği, WOMAC ve OAKHQOL'de artan radyolojik evre ilişkili ağrının aksine radyolojik derece ile ilişkili bulunmadı. Bu sonuç, BPI ölçeğinin OA ağrısını değerlendirmek için sınırlı olabileceğini göstermektedir.

Anahtar Kelimeler: Osteoartrit; ağrı; uyku; yaşam kalitesi

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Osteoarthritis (OA) is a painful disease often seen in the elderly and a disability reason associated with morphological changes in the subchondral bone, articular cartilage degeneration, functional restrictions, and damage surrounding soft tissue. Of the world population, 10% has clinical symptoms of OA, while 33% of adults and 90% of individuals over 65 have radiological OA findings. In the general American adult population, the prevalence was estimated at 12.1% of the population aged 25-74 years had clinically defined OA of some joint.[1-3] According to the World Health Organization estimates, roughly 25% of adults over 65 years of age have pain and dysfunction due to this disease. Although OA affects almost every age group, the prevalence increases dramatically over 50 years of age for men and 40 years of age for women.[4] In a study conducted in our country, the symptomatic knee OA (KOA) prevalence in Turkish individuals aged 50 and over is 14.8%.[5]

This study aimed to assess the cross-sectional relations between (change in) pain, quality of life, and sleep measures based on Brief Pain Inventory Short Form scale (BPI), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Pittsburgh Sleep Quality Index (PSQI), OsteoArthritis Knee and Quality of Life Scale in the Lower Legs (OAKHQOL) scales.

The research questions for this study were:

1. How does knee pain in OA affect sleep and life quality?

2. Is there a relationship between a radiological stage of OA and BPI, OAKHQOL, PSQI, WOMAC scores?

3. Is there any difference in pain subscales in terms of BPI and WOMAC?

MATERIAL AND METHODS

PARTICIPANTS &SELECTION CRITERIA

All data were collected from 151 KOA patients who applied to the outpatient clinics of Physical Medicine-Rehabilitation and Family Medicine at Gaziosmanpaşa Training and Research Hospital between August 2018 and November 2018. Only volunteers (>40 years old) diagnosed with OA based on the criteria of the American College of Rheumatology (ACR) were included in the study.[6]ACR decision tree describes patients with knee pain have OA if they fulfill one of the following groups of criteria: 1) Crepitus, morning knee stiffness of 30 min or less, and age of 38 years or above 2) Crepitus, morning stiffness of longer than 30 min, and bony enlargement 3) No crepitus, but bony enlargement.[7]

Exclusion criteria in patients were; (i) those who have an operation history in the knee (ii) history of inflammatory rheumatic disease (iii) coexisting cancer disease (iv) those who are not willing to participate in the research (v) those with communication problems.

OUTCOME MEASURES

Kellgren-Lawrence Radiological Staging in Osteoarthritis: Disease severity in OA is usually graded based on the Kallegren-Lawrence radiological staging as OA has no specific laboratory findings. Assessment of osteophytes and narrowing in the joint space are indicators based on four grades.[8]

Brief Pain Inventory Short Form in Turkish: The BPI was developed to afford a rapid and simple means of measuring pain intensity and its extent. Validity and reliability of musculoskeletal system pain with BPI were performed in the Turkish language by Çelik et al. The extent of the BPI Turkish version and VAS (Visual analog scale for pain) correlation was statistically significant.[9]

The Western Ontario and McMaster Universities Osteoarthritis Index in Turkish: The validity and reliability study for the Turkish version of the WOMAC OA Index was conducted by Tüzün et al. Higher score means worse symptoms and high physical limitation.[10]

Pittsburgh Sleep Quality Index in Turkish: PSQI evaluates sleep quality in the last month. The validity and reliability studies of the scale for Turkish were conducted in 1996 by Ağargün et al. Total PUKI score means good sleep quality for 0-4 points and poor sleep quality between 5-21 points.[11]

OsteoArthritis Knee and Quality of Life Scale in the Lower Legs: The OAKHQOL scale developed

by Rat et al. as 43 items. It consists of 5 sub-dimensions: physical activity, mental health, pain, social support, and social functions. The Turkish validity and reliability study was done by Duruöz et al.[12]

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

The Taksim Training and Research Hospital, Clinical Research Ethics Committee reviewed and approved this study on the date 08.08.2018 (Approval no: 0080). All authors have read and accepted the Helsinki Declaration Principles, and the study has been done accordingly. Verbal consent of all participants was obtained.

STATISTICAL ANALYSIS

Data were analyzed by IBM SPSS Statistics 22 (SPSS IBM, Turkey) program. Frequency, percentage, mean, standard deviation, median, minimum and maximum values were used as descriptive statistics. One-way Anova Test (for WOMAC and OAKHQOL subscales to compare with radiological grade) and Kruskal-Wallis Test (for BPI and PSQI subscales to compare with radiological grade) were used. Correlation coefficients were evaluated; excellent r≥0.91; good 0.90≥r≥0.71; fair 0.70≥r≥ 0.51; weak 0.50≥r≥ 0.31; little or none r ≥%0.3. Cronbach's alpha coefficients were calculated for the reliability analysis of the scales. 0.70 or the higher value was accepted as reliable. Significance was evaluated at the level of $p < 0.05$.

RESULTS

A total of 151 patients (age=60.14±8.95), containing 127 (84.1%) female and 24 (15.9%) male individuals, completed the study in three months. The age of men (67.6±8.3 years) was higher than that of women (59±8.4 years) (Table 1). Male gender had a higher mental health score of OAKHQOL (men 71.92±16.35; women 58.18±16.82; $p<0.001$) and a

TABLE 1: Assessment of demographic data.

Variables		Minimum-Maximum	Mean±SD
Age	Female	41-79	58.73±8.37
	Male	46-81	67.58±8.33
BMI	Female	23.44-43.28	32.02±4.94
	Male	19.03-37.98	29.26±5.12
		n	%
Gender	Female	127	84%
	Male	24	16%
Marital status	Married	111	73%
	Single	40	27%
Education level	Illiterate	45	29.8%
	Basic education	96	63.6%
	High school/ University	10	6.6%
Income level	Low	43	28.5%
	Moderate	93	61.6%
	High	15	9.9%
Smoking	No	96	63.6%
	Yes	16	10.6%
	Ex-smoker	39	25.8%
Employment status	Retired	43	28.5%
	Employed	10	6.6%
	House-wife	98	64.9%
Radiological grade	Grade 1	39	25.8%
	Grade 2	56	37.1%
	Grade 3	34	22.5%
	Grade 4	22	14.6%

Data are presented as frequency, percentage, mean±standard deviation, minimum and maximum values.
BMI: Body mass index; SD: Standard deviation.

lower sleep disturbance score (women 2.12±0.61; men 1.75±0.61; p= 0.009).

Radiological severity was observed to be 25.8% in Grade 1, 37.1% in Grade 2, 22.5% in Grade 3, and 14.6% in Grade 4, according to Kallegren-Lawrence staging. Table 2 shows the evaluation of scales by radiological grade and relationship with OAKHQOL, WOMAC, BPI, PSQI. The correlations of scales with radiological stage, age, body mass index (BMI) have been indicated in Table 3. There was a difference between the radiological stages for Grade 4 cases than that of others in terms of physical activity, pain, and social support subscales of OAKHQOL (p<0.001; p=0.035; p=0.024, respectively). The pain, stiffness, disability scores of WOMAC scale had differences in favor of radiologically Grade 4 cases significantly (p=0.004, p=0.023, p=0.001, respectively), and there was a weak negative correlation between OAKHQOL physical activity (disability) score and radiological grade (p<0.001; r=-0.322). There was no difference between the radiological grades based on BPI subscales (pain severity and pain interference subscale; p=0.538 p=0.627, respectively). The social support score of Grade 1 cases was lower than grade 2 (p=0.042) and Grade 4 (p=0.037). The pain score of Grade 4 cases was lower than that of Grade 1 (p=0.048) and Grade 2 (p=0.013). Age was correlated with pain (p=0.004 r=0.234) and physical disability scores (p<0.001 r=0.285). BMI was correlated with only physical disability score (p=0.033 r=0.174). All patients with OA had poor sleep quality. PSQI scores were not radiologically different and had no relationship with radiological grade.

Table 4 has demonstrated that BPI and WOMAC subscales were correlated with sleep quality based on

TABLE 2: Comparison of OAKHQOL, WOMAC, BPI, PSQI with the radiological stage in patients with knee osteoarthritis.

Scales	Grade 1	Grade 2	Grade 3	Grade 4	p value
OAKHQOL	**mean±SD**	**mean±SD**	**mean±SD**	**mean±SD**	**p**
Physical activity	53.78±20.45	54.35±18.61	46.14±20.04	32.87±18.78	**0.000**
Mental health	60.06±19.1	59.52±15.04	59.68±17.02	64.09±21.16	0.757
Pain	47.12±23.55	49.46±20.81	39.12±24.55	35±23.7	**0.035**
Social support	58.01±23.63	71.52±23.26	65.44±24.76	72.73±16.64	**0.024**
Social function	46.75±18.33	55.54±19.16	54.02±15.87	51.82±20.46	0.140
BPI	**mean±SD (median)**	**mean±SD (median)**	**mean±SD (median)**	**mean±SD (median)**	**p**
Pain severity	3.77±1.93 (3.25)	3.64±1.79 (3.5)	3.98±2.15 (4.13)	4.11±2 (4.13)	+0.538
Pain interference	2.87±2.64 (1.71)	2.78±2.36 (2.21)	3.12±2.49 (2.57)	3.62±2.9 (2.64)	+0.627
WOMAC	**mean±SD**	**mean±SD**	**mean±SD**	**mean±SD**	**p**
Pain	50.51±17.61	47.23±19.88	55.74±21.78	64.55±18.96	**0.004**
Stiffness	41.67±30.26	39.06±25.12	46.69±30.97	60.8±29.7	**0.023**
Physical activity (Disability)	48.34±21.8	48.21±18.85	55.58±18.25	66.44±19.61	**0.001**
Total score	48.24±20.21	47.25±18.27	54.87±18.98	65.58±19.2	**0.001**
PSQI	**mean±SD (median)**	**mean±SD (median)**	**mean±SD (median)**	**mean±SD (median)**	**p**
Sleep quality	1.13±1.06 (1)	1.18±0.99 (1)	1.47±1.13 (1)	1.55±1.14 (1.5)	+0.331
Sleep latency	2±1 (2)	2.14±1.07 (3)	1.91±1.16 (2)	2.23±1.07 (3)	+0.584
Sleep duration	1.49±1.32 (1)	1.11±1.07 (1)	1.44±1.26 (1.5)	1.32±1.39 (1)	+0.577
Sleep efficiency	1.23±1.16 (1)	1±1.18 (0.5)	1.32±1.27 (1)	1.68±1.32 (1.5)	+0.156
Sleep disturbance	2.08±0.62 (2)	2.05±0.64 (2)	2±0.55 (2)	2.14±0.71 (2)	+0.863
Sleep medication	0.38±1.02 (0)	0.41±1.02 (0)	0.88±1.39 (0)	0.36±0.95 (0)	+0.183
Daytime sleep dysfunction	0.74±1.04 (0)	0.75±0.88 (0.5)	0.74±1.02 (0)	0.77±0.81 (1)	+0.917
Total score	9.05±4.58 (9)	8.64±4.06 (8)	9.76±4.17 (9.5)	10.05±4.41 (10)	+0.457
One-way ANOVA Test +Kruskal-Wallis Test					

BPI: Brief Pain Inventory Short Form scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; PSQI: Pittsburgh Sleep Quality Index; OAKHQOL: OsteoArthritis Knee and Quality of Life Scale in the Lower Legs; SD: Standard deviation.

Data are presented as mean±standart deviation (median). p<0.05 was considered statistically significant.

TABLE 3: Comparison of OAKHQOL, WOMAC, BPI, PSQI scores with radiological stage, age and BMI.

Scales		Radiological Grade	Age	BMI
OAKHQOL				
Physical activity	r value	-0.322	-0.326	-0.252
	p value	**0.000**	**0.000**	**0.002**
Mental health	r value	0.058	-0.001	-0.114
	p value	0.478	0.990	0.165
Pain	r value	-0.200	-0.129	-0.203
	p value	**0.014**	0.114	**0.012**
Social support	r value	0.158	0.032	0.171
	p value	0.053	0.693	**0.036**
Social function	r value	0.089	0.031	0.142
	p value	0.275	0.701	0.082
BPI				
Pain severity	r value	0.110	0.167	+0.092
	p value	0.178	**0.040**	0.262
Pain interference	r value	0.126	0.192	+0.097
	p value	0.124	**0.018**	0.237
WOMAC				
Pain	r value	0.234	0.206	0.127
	p value	**0.004**	**0.011**	0.119
Stiffness	r value	0.204	0.105	0.082
	p value	**0.012**	0.198	0.315
Physical activity (Disability)	r value	0.285	0.334	0.174
	p value	**0.000**	**0.000**	**0.033**
Total score	r value	0.282	0.299	0.163
	p value	0.000	0.000	0.045
PSQI				
Sleep quality	r value	+0.144	0.005	0.115
	p value	0.077	0.952	0.160
Sleep latency	r value	+0.041	0.065	-0.037
	p value	0.621	0.431	0.653
Sleep duration	r value	+-0.020	0.005	-0.039
	p value	0.806	0.956	0.632
Sleep efficiency	r value	+0.104	0.155	-0.094
	p value	0.204	0.058	0.253
Sleep disturbance	r value	+0.000	-0.184	0.060
	p value	0.996	**0.024**	0.467
Sleep medication	r value	+0.085	0.199	-0.008
	p value	0.297	0.014	0.921
Daytime sleep dysfunction	r value	+0.024	0.105	0.030
	p value	0.768	0.200	0.711
Total score	r value	+0.097	0.111	-0.005
	p value	0.234	**0.174**	0.948

BMI: Body Mass Index; BPI: Brief Pain Inventory Short Form scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; PSQI: Pittsburgh Sleep Quality Index; OAKHQOL: OsteoArthritis Knee and Quality of Life Scale in the Lower Legs.

Data are presented as mean±standart deviation (median). $p<0.05$ was considered statistically significant.

PSQI and OAKHQOL subscales (except for social support and social function subscales). Pain severity (BPI) did not affect the use of sleep medication and daytime sleep dysfunction while other PSQI subscales were affected. Pain interference was associated with all PSQI subscales except for sleep medication use.

Table 5 shows the relationship between quality of life and sleep quality. Physical activity, mental health and pain subscales of OAKHQOL negatively correlated with all PSQI subscales (sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication, and daytime sleep dysfunction).

TABLE 4: The correlation of WOMAC and/or BPI compared with PSQI, OAKHQOL, and each other.

Scales		WOMAC			BPI	
		Pain	Stiffness	Physical activity (Disability)	Pain severity	Pain interference
PSQI						
Sleep quality	r value	0.417	0.427	0.412	0.437	0.425
	p value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Sleep latency	r value	0.383	0.257	0.379	0.273	0.362
	p value	**0.000**	**0.001**	**0.000**	**0.001**	**0.000**
Sleep duration	r value	0.183	0.149	0.225	0.137	0.210
	p value	**0.024**	0.067	**0.006**	0.093	**0.010**
Sleep efficiency	r value	0.300	0.231	0.380	0.212	0.204
	p value	**0.000**	**0.004**	**0.000**	**0.009**	**0.012**
Sleep disturbance	r value	0.364	0.356	0.344	0.231	0.316
	p value	0.000	0.000	0.000	0.004	0.000
Sleep medication	r value	0.095	0.066	0.132	-0.016	0.065
	p value	0.244	0.421	0.105	0.849	0.425
Daytime sleep dysfunction	r value	0.222	0.197	0.256	-0.001	0.182
	p value	**0.006**	**0.016**	**0.001**	0.986	**0.026**
Total score	r value	0.466	0.393	0.513	0.289	0.402
	p value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
OAKHQOL						
Physical activity	r value	-0.709	-0.545	-0.873	-0.546	-0.606
	p value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Mental health	r value	-0.287	-0.310	-0.397	-0.299	-0.460
	p value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Pain	r value	0.709	- 0.491	0.677	- 0.600	0.513
	p value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Social support	r value	-0.083	-0.052	-0.126	-0.004	-0.140
	p value	0.310	0.526	0.123	0.962	0.086
Social function	r value	-0.031	-0.050	-0.040	0.032	-0.032
	p value	0.709	0.543	0.625	0.694	0.698

Pearson Correlation Test

BPI: Brief Pain Inventory Short Form scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; PSQI: Pittsburgh Sleep Quality Index; OAKHQOL: OsteoArthritis Knee and Quality of Life Scale in the Lower Legs.

Data are presented as mean±standart deviation (median). p<0.05 was considered statistically significant.

Internal consistency of scales was evaluated by Cronbach's α values, which were calculated 0.88, 0.95, 0.84, 0.87, 0.67 for OAKHQOL**,** WOMAC, BPI (pain severity), BPI (pain interference), PSQI, respectively. According to our study, a large part of Cronbach's α values for subscales were higher than 0.70, which means good reliability.

DISCUSSION

In this study, we found that radiological grading of OA was correlated with the pain, disability, and stiffness. All patients with OA had a poor sleep quality related to pain regardless of radiological grade. Despite the pain subscales of WOMAC and OAKHQOL related to the radiological grade, the BPI's pain subscales were not. It was thought that the BPI scale might be limited in measuring OA pain, cause the BPI to be developed to assess musculoskeletal pain.

AGE AND GENDER

OA of the knee is twice as common in women as in men.[13] Hong Kong population had a presence of OA disease three times higher in women (40%) than that of men (12%).[14] In a longitudinal study of Tang et al. knee OA (mean age 59.8 years) was more common in women (10.3%) than men (5.7%), increased with age until a plateau around the age of 70 years.[15] In our study, the mean age was around 60 years, and men's age was greater than women's despite 84.1% of OA patients were female. It was similar to the

TABLE 5: The Correlation of OAKHQOL and PSQI in patients with osteoarthritis.

	OAKHQOL					
		Physical activity	Mental health	Pain	Social support	Social function
PSQI						
Sleep quality	r value	-0.371	-0.400	-0.506	-0.193	0.057
	p value	**0.000**	**0.000**	**0.000**	**0.018**	0.484
Sleep latency	r value	-0.354	-0.345	-0.421	-0.078	-0.044
	p value	**0.000**	**0.000**	**0.000**	0.344	0.594
Sleep duration	r value	-0.225	-0.243	-0.344	-0.199	0.035
	p value	**0.005**	**0.003**	**0.000**	0.014	0.666
Sleep efficiency	r value	-0.382	-0.203	-0.364	-0.177	0.007
	p value	**0.000**	**0.012**	**0.000**	**0.030**	0.934
Sleep disturbance	r value	-0.344	-0.400	-0.411	-0.245	-0.093
	p value	**0.000**	**0.000**	**0.000**	**0.002**	0.258
Sleep medication	r value	-0.168	-0.138	-0.077	-0.160	-0.050
	p value	**0.040**	0.092	0.348	0.053	0.544
Daytime sleep dysfunction	r value	-0.242	-0.298	-0.180	-0.079	-0.054
	p value	**0.003**	**0.000**	**0.027**	0.336	0.507
Total score	r value	-0.503	-0.474	-0.555	-0.270	-0.023
	p value	**0.000**	**0.000**	**0.000**	**0.001**	0.779
Pearson Correlation Test						

PSQI: Pittsburgh Sleep Quality Index; OAKHQOL: OsteoArthritis Knee and Quality of Life Scale in the Lower Legs.
Data are presented as mean±standart deviation (median). p<0.05 was considered statistically significant.

study of Atamaz et al., suggesting that women were affected by OA earlier than men.[16]

In the study of Özvurmaz et al., 89% of the elderly patients have poor sleep quality which supports that the sleep quality deteriorates with age.[17] In our study, a correlation was found between sleep disturbance and age, and a conclusion was reached that use of sleep medication increased in OA patients in old age.

PAIN AND RADIOLOGICAL STAGE

Kiadaliri et al. found that ACR clinical definition of knee OA was associated with poorer quality of life (HRQOL) than the definition based on radiographic knee OA.[18] In poorer Mahmoud et al., the evaluation of radiographic features of knee OA showed that most of the recruited patients were Grade 3 (56%), 30% Grade 2, and 14% Grade 1. Grade 1 (14%) OA patients had a significantly higher pain score (OAKHQOL pain subscale) than that of Grade 2 (30%) and Grade 3 (56%).[19] In the study of Erdanoğlu et al., there was a statistically significant difference in pain severity and functional level between early and late-stage OA patients by VAS and Kellgren-Lawrence staging.[20] In our study, all OA patients were diagnosed clinically and then compared radiologically. There was a negative relationship between pain subscale score of OAKHQOL (low score means high pain) and radiological stage similar to literature and our Grade 4 (14.6%) patients had a lower pain score than that of Grade 1 (25.8%), Grade 2 (37.1%) and Grade 3 (22.5%) patients. In another study, the risk of incident radiographic knee OA was significantly increased among subjects with higher baseline body mass index, previous knee injury, and a history of regular sports participation (physical activity).[21] Our study obtained a relationship for pain and a negative correlation for physical activity of OAKHQOL subscales with radiological grade.

PAIN AND SLEEP

In the study of Dai et al., persons who reported better sleep quality tended to have less frequent use of prescription NSAIDs (as sleep medication) have less severe knee pain reflected by a lower WOMAC score at baseline.[22] In our study, the mean WOMAC score was 51.9±19.9, and a high WOMAC score was not

correlated with high use of sleep medication such as painkillers, antidepressants, etc.

Due to a significant relationship between mental health (OAKHQOL) and PSQI scores suggest that men sleep better and a significant negative relationship between WOMAC pain and mental health, perception of pain would be related to mental health. Since the women in the study group also coincide with the menopausal and postmenopausal period, the high average of sleep disturbance in women may be attributed to more frequent occurrences in women such as excessive cold and overheating in the questions.

Sleep disorders are prevalent in patients with OA and concern more than two-thirds of OA patients suffering from fatigue.[23] The study of Heffner et al. indicated that participants in the cognitive-behavioral therapy for insomnia group relative to the control group showed significantly larger declines over time in insomnia severity and larger improvements in OA-related symptoms based on the total score on the WOMAC, which was due to reductions in physical limitations, but no pain.[24] In our study, all participants had poor sleep quality based on PSQI and poor sleep quality was correlated with pain based on both WOMAC and BPI scales.

Sleep disturbances may also be related to the analgesic or sedative medications used for pain treatment. Nonsteroidal anti-inflammatory drugs (aspirin and ibuprofen) increase sleep latency. Opioids increase nocturnal wake time, both in terms of prolonged sleep latency and increased awakenings across the night. Adjuvant analgesics (tricyclic antidepressants) decrease REM sleep and nocturnal awakening.[23-26] In the study of Tang et al., sleep quality was a consistent predictor of pain the next day and they obtained pain interference (BPI interference subscale score) 47.0±13.1 points.[26] In our study, although 84.3% of patients used antidepressants for pain treatment and 94% used painkillers, there was no relationship between sleep medication use and pain parameters and our BPI interference subscale score was 3±2.53 points. High pain severity and pain interference were related to poor sleep quality, sleep latency, sleep efficiency, and sleep disturbance in our study.

In the study of Çelik et al., the BPI-Turkish version's reliability analysis was satisfactory: Cronbach's α values were >0.80, in agreement with previous data and the BPI-Turkish version better-measured pain interference with daily life than did VAS.[9] They found that the BPI scale might be used for musculoskeletal pain. We tried to use the BPI scale in OA pain and found that Cronbach's α values for pain severity and pain interference were >0.80. Although WOMAC and OAKHQOL pain parameters were compatible with the radiological stage, BPI did not match the radiological stage. So, we thought that BPI pain measurement was limited for OA pain.

PAIN AND QUALITY OF LIFE

In the study of Mahmouidi et al. the average values of the different dimensions of OAKHQOL "Physical Activities", "Mental Health", "Pain", "Social Support", "Social Activities" were 47.5/100; 39.8/100; 61.2/100; 56.1/100 and 74.2/100, respectively. The score of the dimension "Mental Health" was the most altered, proving that knee OA hurts patients' psychology.[27] In the study of Mahmoud et al., the normalized OAKHQOL questionnaire scores showed that the pain domain had the lowest and worst score (49.8±15.4), while the mental health scored the highest (60.1±8.2).[19] In our study, the average scores of OAKHQOL "Physical Activities", "Mental Health", "Pain", "Social Support", "Social Activities" were respectively 49.2/100; 60.4/100; 44.4/100; 66.8/100 and 52.3/100. The significant relationship between WOMAC physical activity score and OAKHQOL mental health may also be due to the positive effects of physical activity on the mind.

Cronbach's alpha value for pain subscale of OAKHQOL was calculated as 0.82, while it was 0.55 for mental health and 0.83 for physical activity. In the reliability analysis of OAKHQOL in a Columbian older adult population with knee and hip OA, internal consistency was obtained at a rate of 0.90 for mental health and at a rate of 0.94 for physical activity, while that for pain was 0.89.[28] The difference between the reliabilities of mental health subscales may depend on the difference in transcultural adaptation.

STUDY LIMITATIONS

Because participants' education level was not in a normal distribution, replying to many questions was especially difficult for older participants. Another significant limitation was that we could not include other variables, such as fatigue, anxiety, or depression, to examine their impact on sleep and pain; hence, these variables should be considered in future studies.

CONCLUSION

Although OA patients' radiological grading was related to OA pain parameters in OAKHOAL and WOMAC, it was not related to the BPI scale's pain parameters. We thought that it was a result of the BPI scale that would be limited for OA pain detection as it was developed for musculoskeletal system pain. We hope that our study would have a contribution to OA literature since we used BPI as a different approach to measure pain.

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Conflict of Interest

No conflicts of interest between the authors and/or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

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