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Risk Factors of Symptomatic Knee, Hand and Hip Osteoarthritis in a Suburban Area of İzmir City

İzmir İlindeki Semptomatik Diz, El ve Kalça Osteoartrit Risk Faktörleri

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Abstract

Objective: To determine the risk factors of symptomatic knee, hand, and hip osteoarthritis among people aged ≥40 years in a suburban area of İzmir City, Turkey

Material and Methods: A total of 522 subjects were randomly chosen with systematic randomization. All subjects fulfilled a detailed survey and had a physical examination. Any subject who met at least one of the ACR clinical criteria for knee/hand/hip osteoarthritis (OA) was considered as screening positive and was invited for x-rays.

Results: We report that the symptomatic knee, hand, and hip osteoarthritis prevalence correspondingly increases with age. Symptomatic knee osteoarthritis (SKO) has a positive correlation with female gender (OR: 26.5, 95% CI: 7.6-92.3), obesity, morbid obesity (OR:5.8, 95% CI:2.1-16.2), and regular prayer habit (namaz) (OR:2.6, 95% CI: 1.1-6.2). SKO and symptomatic hand osteoarthritis (SHaO) prevalence numbers are higher in the postmenopausal female group than premenopausal women ($p<0.05$). We determined that poorly educated people had a 1.5-times higher risk for developing SKO ($p=0.649$). Non-smokers had 1.5 times the risk of smokers for developing OA. Subjects lacking symptomatic knee OA were found to be significantly more active than the other groups.

Conclusion: Risk factors for development of symptomatic knee, hand, and hip osteoarthritis were determined as female gender, advanced age, obesity, and being in postmenopausal stage. Low education level, being a non-smoker, having a regular prayer habit, climbing stairs, being a worker, and sedentary life were also risk factors for having knee osteoarthritis. It is an obvious issue that we need countrywide studies with larger populations to build a health policy for osteoarthritis.

Key Words: Osteoarthritis, epidemiology, risk factors

Özet

Amaç: İzmir ilinde yaşayan, 40 yaş ve üzeri popülasyonda semptomatik diz, el ve kalça osteoartrit risk faktörlerinin saptanması.

Gereç ve Yöntemler: Çalışmamızda 522 kişi sistematik randomizasyon metodu ile seçilmiştir. Katılımcılara detaylı bir anket uygulanarak, fizik muayeneleri yapılmıştır. ACR'ın diz/el/kalça osteoartriti klinik kriterlerinden bir tanesine sahip olan kişiler osteoartrit açısından şüpheli olarak değerlendirilip, grafi çekilmek üzere davet edilmiştir.

Bulgular: Semptomatik diz, el ve kalça osteoartrit prevalansı yaşla beraber artış gösterdi. Semptomatik diz osteoartriti kadın cinsiyet (OO:26,5, %95 GA: 7,6-92,3), obezite, morbid obezite (OO:5,8, %95 GA:2,1-16,2) ve düzenli namaz kılma (OO:2,6, %95 GA: 1,1-6,2) ile pozitif korelasyon gösterdi. Semptomatik diz ve el osteoartriti prevalansı postmenopozal kadınlarda daha yüksek bulundu ($p<0,05$). Öğrenim düzeyi düşük bireylerde semptomatik diz osteoartritinin 1,5 kat daha fazla olduğu görüldü ($p=0,649$). Sigara içmeyenlerde 1,5 kat daha fazla osteoartrit oluşma riski saptandı. Semptomatik diz osteoartriti olmayan bireylerin aktivite düzeyleri diğerlerinden anlamlı derecede yüksek bulundu.

Sonuç: Semptomatik diz, el ve kalça osteoartriti için risk faktörleri kadın cinsiyet, ileri yaş, obezite ve postmenopozal dönemdir. Düşük eğitim düzeyi, sigara içmemek, düzenli namaz kılmak, merdiven çıkmak, işçi olarak çalışmak ve sedanter yaşam sürmek gibi durumlar diz osteoartriti için risk faktörleridir. Osteoartritle ilgili bir sağlık politikası oluşturmak için ülke genelinde daha büyük popülasyona sahip çalışmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Osteoartrit, epidemiyoloji, risk faktörleri

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Introduction

Osteoarthritis (OA) is the most common form of arthritis (1) and is a major cause of disability in people aged ≥65 years (2,3). According to the World Health Organization (WHO), osteoarthritis causes disability for approximately 10% of people who are 60 years old or over around the globe (4). In 2007, the United Nations announced that the world population would increase by 2.5 billion until 2050 (5,6).

Incidence and prevalence studies about OA provide useful information about the natural course and predisposing/prophylactic factors of OA. However, there is a certain handicap about determining the prevalence of OA, because some patients may have radiological findings whilst having no clinical symptoms. Thus, OA prevalence is usually reported to be relatively high by studies based solely on radiological criteria. We used the clinical criteria of the American College of Rheumatology (ACR) for screening OA before radiological evaluation to optimize results.

When we reviewed the literature, we could not find any countrywide studies about the prevalence of osteoarthritis in Turkey. A previous study was carried out in Ankara about radiographical hip osteoarthritis prevalence in 2001, and the prevalence was found to be 8.8% (7). Another cross-sectional study was conducted in the center of Antalya City about the prevalence of symptomatic knee osteoarthritis and distal interphalangeal (DIP) joint osteoarthritis (8). The Antalya study reported a symptomatic knee OA prevalence of 14.8% and a distal interphalangeal OA prevalence of 10.5% among people aged ≥50 years (8). The same study reported risk factors for OA as advanced age, female gender, and type of household (8).

Material and Methods

This cross-sectional study was carried out to determine the risk factors for developing knee, hand, and hip OA among people who were ≥40 years old in a suburban area of İzmir City. The population of this area was 17.682 according to the latest population census made in 2007; 10440 people were ≥40 years old.

The study was conducted between May and June 2009. The population of the study was chosen randomly from 10.440 people who were ≥40 years old. By using the Epi Info program, a sample size of 522 subjects was calculated as adequate assuming a 0.5% margin of error and 95% confidence level. The sample group was selected by systematic sampling one by one. Before participation, all subjects signed an informed consent form, which was approved by the ethical committee. The address and phone numbers were obtained from the database of Mukhtar. If an individual refused to participate in the study, changed his/her address, or met one of the exclusion criteria (1. metabolic diseases, like ochronosis, acromegaly, hemochromatosis; 2. anatomic causes, like slipped capital femoral epiphysis, Perthes disease, hypermobility syndrome; 3. having a major trauma, such as polytrauma or multitrauma, joint surgery, fracture; 4. inflammatory causes; 5. intraarticular tumor; or 6. neurological causes, like severe peripheral neuropathy, being adapted to a wheelchair, being mentally retarded), another individual following up in the list was chosen to reach the calculated sample size, 522.

Five hundred twenty-two subjects were interviewed by one of the authors face to face and completed a detailed survey, which included information about detailed demographic data (age, sex, marital status, education status, income) and risk factors (type of household, number of stairs, toilet type, prayer habit (namaz), chronic diseases, cigarette or alcohol addiction, menstrual status (pre- or postmenopausal), physical activities, any medication, hormone replacement therapy, and previous therapies about joint diseases). Afterwards, all patients had a physical examination, which was performed by the same author using a standard protocol to search for any clinical findings of ACR criteria for a knee/hand/hip OA diagnosis (9-11). Physical findings, like crepitation, joint tenderness, deficiency in range of motion, deformities, Heberden and/or Bouchard nodules, and first carpometacarpal (CMC) joint involvement, were all noted. Subjects who met at least one of these criteria were accepted as screening positive. Weight and height were measured with the same bascule and ruler; also, body mass index (BMI) was calculated by weight (kg)/length^2(m^2) formula. BMI values were classified as underweight (<18.5 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25-29.9 kg/m^2), obese (30-39.9 kg/m^2), and morbid obese (≥40 kg/m^2).

After physical examination, 192 of 522 subjects were suspected for knee, hand, or hip OA. Of these, 10 already had radiographs and 30 refused to come (2 had breast Ca, 1 had gastric Ca); 152 subjects were invited to the radiology department for x-rays. Radiological monitoring was corroborated by a research foundation (Project No: 09.TIP-15). Hand x-rays were taken bilaterally, two-directional knee radiographs were taken with knees flexed while the patient was standing still (weight bearing), and hip x-rays were taken in the supine position. Two radiologists evaluated x-rays according to the Kellgren-Lawrence (KL) scoring system. Radiological diagnosis of knee, hand, and hip osteoarthritis was accepted as positive if the radiographical grade was 2 or higher in one specific joint. Diagnosis of symptomatic knee (9), hand (10), and hip (11) osteoarthritis was made based on American College of Rheumatology classification criteria.

Statistical Analysis

All analyses were conducted using SPSS v.14.0 for Windows. Demographical data and mean standard deviation of variables are shown in tables. Categorical variables are shown in frequency tables. Shapiro-Wilk test was carried out to determine equal distribution of values. Student t-test was used for matched groups, and Mann-Whitney U-test was used for non-equal distributed variables. When studying normal variables, chi-square or Fisher's exact chi-square test was used by making cross-tables. For significance, p value was assigned as ≤0.05.

Results

Our study included a population of 390 (74.7%) women and 132 (25.3%) men. They were all ≥40 years old. Average age was 53.9±8.5, and men were older than women (p=0.001). Average BMI was 29.6±4.6 kg/m^2, and women had higher BMI (p<0.001). The obese population had higher average age (Table 1).

The prevalence of symptomatic knee, hand, and hip osteoarthritis of people aged ≥40 years was found to be 20.9%, 2.8%, and 1.0%, respectively. Symptomatic knee osteoarthritis (SKOA) prevalence was found to be 26.6% in women and 4.7% in men. Symptomatic hand osteoarthritis (SHaOA) prevalence was reported as 3.8% in women and 0% in men. SKOA and SHaOA were significantly ($p<0.05$) common in woman (Table 2). Symptomatic hip osteoarthritis (SHOA) prevalence was 0.8% in women and 1.5% in men, and there was no significant difference between genders ($p>0.05$) (Table 2) (12).

Symptomatic hand osteoarthritis involved mostly DIP joints (92.9%). The first CMC joint (21.4%) and proximal interphalangeal (PIP) joints (7.1%) were also involved. SHaOA was more frequent in women ($p<0.05$) (12). Hand OA had symmetrical involvement in all cases. DIP joint OA had a significant relation with ($p<0.05$) knee OA; 69.2% of subjects having DIP joint OA also had knee OA.

We report that the symptomatic knee, hand, and hip osteoarthritis prevalence correspondingly increases with age. According to the KL scoring system, most patients with symptomatic knee, hand, and hip OA were grade 2; 47.6% of SKOA, 78.6% of SHaOA, and 60% SHOA cases had grade 2 osteoarthritis.

Also, 95.1% of subjects had bilateral SKO, and 60% had bilateral SHO. All cases with SHaO had bilateral involvement (Table 3).

After logistic regression analysis, we found that SKO had a positive correlation with female gender (OR:26.5, 95% CI: 7.6-92.3), obesity, morbid obesity (OR:5.8, 95% CI:2.1-16.2), and regular prayer habit (namaz) (OR:2.6, 95% CI: 1.1-6.2). However, it had a negative correlation with relatively sedentary life, like being a housewife or office job professions (OR: 5.8, 95% CI: 2.1-16.2).

Premenopausal women had one-half the risk of developing SKO when compared to postmenopausal women ($p=0.097$). Also, SKO development risk was 0.3 times less in patients having hormone replacement therapy (9.4% of postmenopausal women), but these values did not significantly affect overall risk rates ($p=0.148$). SKO and SHaO prevalence numbers were higher in the postmenopausal female group than premenopausal women ($p<0.05$); yet, no difference was noted in SHO population by means of menopause.

We determined that poorly educated people had a 1.5 times higher risk for developing SKO ($p=0.649$). Non-smokers had 1.5 times the risk of smokers for developing OA. However, these values were lower than we anticipated. We also report that there was no significant difference about SHaOA and SHOA between poorly educated and well-educated people ($p>0.05$).

The number of non-smokers was significantly higher within the SKO population, while there was no difference between the SHaO and SHO group. We did not note any correlation with SKO, SHaO, and SHO prevalence and alcohol consumption.

Symptomatic knee osteoarthritis prevalence had a positive correlation with prayer habit (namaz) ($p=0.001$), whereas there was no relation in the SHO group.

People with SKO and SHO were mostly living in houses (not apartment buildings). The SKO group had a 'routine' or 'necessity' of climbing stairs ($p<0.05$), but there was no difference in the SHO group. Also, there was no significant difference between SKO and SHO group about toilet style (Oriental style or European style).

Table 1. Mean age and BMI ratio

	Man n:132	Woman n:390	All n:522
Age (years) mean±SD	55.9±8.2	53.1±8.5	53.9±8.5
BMI (kg/m^2) mean±SD	28.2±4.3	30.0±4.5	29.6±4.6

Student t-test; p = 0.001; BMI: Body mass index

Table 2. Symptomatic knee, hand, and hip osteoarthritis ratio for gender

	Man n:132	Woman n:390	P
SKO (+)	6 (5.8)	97 (94.2)	<0.001
SHaO (+)	0 (0)	14 (100)	=0.026
SHO (+)	2 (40)	3 (60)	=0.608

Fisher's χ^2 test p<0.05; SKO: symptomatic knee osteoarthritis, SHaO: symptomatic hand osteoarthritis; SHO: symptomatic hip osteoarthritis

Table 3. Bilateral symptomatic osteoarthritis ratio

	Woman n=390	Man n=132	All n=522
BSKO	92 (93.9)	6 (6.1)	98 (95.1)
BSHaO	14 (100)	0 (0)	14 (100)
BSHO	3 (100)	0 (0)	3 (60)

BSKO: Bilateral symptomatic knee osteoarthritis; BSHaO: Bilateral symptomatic hand osteoarthritis; BSHO: Bilateral symptomatic hip osteoarthritis

The SKO group had no significant difference about professions. The SKO group consisted of mostly housewives and workers. We found no significant difference about professions of subjects in the SHaO and SHO group, either.

When activity levels were examined in the study group, the mean value was determined as 1188.0±666.0 MET-min/week. Subjects lacking symptomatic knee OA were found to be significantly more active than the other groups.

Discussion

Prolongation of average life-time and the increment of the elderly population are increasing the prevalence of osteoarthritis worldwide. Although there are numerous studies about the radiological prevalence of OA, there are few about symptomatic OA prevalence (Table 4). Our study is prelusive in Turkey, as it reports symptomatic knee, hand, and hip OA prevalence.

The prevalence of symptomatic knee, hand, and hip OA in individuals over the age of 40 in the suburban area of İzmir City was found to be 20.9%, 2.8%, and 1.0%, respectively. It was also determined that symptomatic knee and hand OA prevalence values were significantly higher for women, whereas there was no significant difference about symptomatic hip OA prevalence between both genders ($p>0.05$) (12).

Table 4. Prevalence of symptomatic knee, hand, and hip OA in European, Asian, and American populations

Symptomatic OA	Country	Prevalence (our study prevalence-same ages considered)
Knee OA		
30+	America	6.1
40+	Spain	16.9 → 20.9
60+	Beijing	11.2 → 40.2
65+	Italy	29.8 → 48.3
45+	Greece	5.7 → 23.9
40+	Shanghai	7.2 → 20.9
Hand OA		
40+	Spain	6.2 → 2.8
60+	China	4.7 → 6.9
65+	Italy	14.9 → 6.9
45+	Greece	1.9 → 3.3
60+	America	8.0 → 6.9
Hip OA		
55-74	America	0.7 → 0.5
60+	China	0.07 → 2.0
65+	Italy	7.7 → 1.7
65+	America	2.2 → 1.7
45+	Greece	0.8 → 1.2

OA: osteoarthritis

Symptomatic knee osteoarthritis prevalence (12) was lower than the Italy Dicamono study (13), which was also carried out using ACR criteria. Our result (12) was higher than the prevalence values of Greece (14) and Beijing (15) studies. It was also higher than the results of a population-based study conducted in Shanghai (16) and Spain (different regions of Spain) (17). In a Turkish Antalya study, a higher SKO prevalence was reported (8). When studies about SHaO were reviewed, we saw that the Dicamono Italy study (13), Spain study (17), and the third phase of the NHANES study of the USA (18) had reported lower rates than our result (12). On the other hand, closer results to ours (12) were found in a Greece study (14). Our result on (12) SHO rate was close to the Greece and USA studies (1,14) yet lower than the Italy Dicamono study (13) and was higher than the China Beijing study (19).

Osteoarthritis prevalence varies according to the age distribution of the population in study, evaluation method, and diagnostic criteria used. It is an important issue to mention which criteria are used for diagnosis, as in many conditions, patients may have radiological findings without clinical symptoms at all. Most studies diagnose OA based on clinical findings or x-rays solely without evaluation of the patient. We used the ACR clinical and clinical/radiological criteria in our study (9-11). We assume that this issue probably had some influence on some of the results, which seem to contradict the existing literature. On the other hand, ACR clinical criteria have a sensitivity of 95% and specificity of 69% for knee OA (9), and ACR clinical and radiological criteria have a sensitivity of 89% and specificity of 91% for hip OA (11).

Our study consisted of a population aged ≥40 years. When we reviewed the literature, we saw that the Shanghai (16) and Spain (17) studies had included individuals ≥40 years of age, whereas other studies have included different age groups. When we reviewed previous results that have been reported, we saw that genetic and ethnic diversity (eg, Chinese people have less frequent acetabular dysplasia) or traditional differences (Chinese people's squatting movement) have some influence on the results.

Our study region contains people who have immigrated from other countries or different regions of Turkey (Simav, Erzurum, Urfa). Simav is located at the west side of Turkey, and the farmers in this township usually have fruit gardens and bean and corn farms. On the other hand, Erzurum and Urfa are located on the east side of Turkey, and people in these cities live on farming and animal breeding.

Age is not a self-contained risk factor for the development of OA, whereas it is undoubtedly the most important of all (20). A wide range of epidemiological studies reveal the importance of age as a risk factor for OA (21-24). In a community-based study, the prevalence and incidence of OA were found to be increased by around 2 to 10 times between the ages of 30 and 65. This correlation continues until the age of 80 (25). The reason for this remains unclear, but we assume that the increment of pain threshold with age or having less trauma in a sedentary lifestyle could be some important causes of lesser pain over the age of 80. In the Spain study (14), SKO prevalence was found to be increasing progressively until 70 years of age. In the Beijing study (11), this age limit was 75 in men and 80 in women. Also, the Greek study reported (10) that SKO was rare under 45 years of age, and the prevalence increased reliantly until 80 years of age and then decreased. EULAR reported that SHaO was found to be rare under 40 years of age, whereas it had a dramatic increase in rate in women after their 40s. Therefore, being over 40 years old was reported (evidence level 2a) as a major risk factor for developing SHaO in numerous studies (26). In a recent study about hip OA, it was shown that between 40-44 years of age, primary radiographical hip OA prevalence was 0.7% and increased to 14% at 85 years of age (27). In the Dicamono study (13), the subjects' average age was higher, and no reports were written about the increment of SHO prevalence with age. However, the Greek study determined an increment of OA prevalence until 80 years of age (14).

When we reviewed SKO, SHaO, and SHO prevalence values, we found parallel evidence to the existing literature. OA prevalence values increase with age, and disease involvement is mostly between the 70-79 age group.

The risk of having OA is higher in women (28). A meta-analysis published in 2010 that examined knee OA risk factors (involving case-control and cohort studies) reported that female gender has a positive influence on OA development, and the coupled odds ratio was found to be 1.84 (95% CI 1.32-2.55) (29). In the EULAR recommendations, female gender was reported as a risk factor for hand OA (evidence level 1b). Also,

prevalence studies report female gender as a relative risk (95% CI 1.11-1.34) (26). It was also revealed that women with developmental hip dysplasia had high risk for hip OA than the male population (30). In the Antalya prevalence study, the symptomatic knee OA rate was found to be 22.5% in women and 8% in men, and DIP OA prevalence was 17.6% in women and 4.3% in men. The same study reported that DIP joint OA prevalence was significantly higher in women ($p<0.001$) (8). We determined the SKO prevalence as 26.6% in women and 4.7% in men; SHaO prevalence was found to be 3.8% in women and 0% in men. However, no difference existed about SHO prevalence between genders ($p>0.05$). It was also determined that women had a 26.5-times higher risk for developing SKO (95% CI 7.6-92.3).

Obesity is the most frequent modifiable risk factor (31-33). In longitudinal Framingham, Chingford, and Baltimore studies, a strong positive correlation was shown between BMI (over 30 kg/m^2) and radiographic knee OA (34-36). At the same time, the relation between obesity and knee OA was stronger in women, and this relation consisted of all 3 compartments (37). On the other hand, the increment of risk rates with obesity for hip OA was not as much as knee OA (38,39). In the EULAR recommendations, obesity takes place among major risk factors for hand OA (evidence level 2a) (26). In line with existing literature, we report that obesity and morbid obesity increase the risk of developing SKO up to 5.8 times in men and women (95% CI 2.1-16.2). It was determined that women had higher BMI than men ($p<0.001$), and women were significantly more obese. Besides, people in the obese group were older than the others, and advanced age was also a risk factor for OA.

It is known that less educated people have higher morbidity rates and increased prevalence for chronic diseases, like diabetes, hypertension, and cardiovascular system pathologies (40,41). A study evaluated the relationship between low education level and radiological/symptomatic knee OA in 2627 subjects (42). It was reported that this relation could be due to low vitamin C and D levels (known as protective for radiological knee OA) and also this population's psychological distress, like depression and lack of self-care, etc. Low education level may be responsible for lack of ability to deal with pain and also for morbidity together with inappropriate usage of joints. Again, in the NHANES-I study, Hannan et al. (43) reported a correlation between low education level and symptomatic, radiological knee OA. On the other hand, there is a study in the literature with conflicting results showing lack of correlation between hip OA development and education level (44). In our study, we categorized education time as low (under 8 years) and high (over 8 years). We found that the male population's education level was significantly higher than women. Parallel with the literature, the SKO group had significantly poor education level, and people with low education level had significantly higher ages and BMIs. However, when we examined corrected odds ratios, we determined that poor education level did not significantly increase SKO risk.

Regular prayer habit is one of the important worships of Islam. Movements, like leaning, crouching, and lying 5 times a day, can create risk for OA development. A study in Ankara reports that there is no difference about hip and knee OA rates, joint space narrowing, and K/L stages between two groups who are performing namaz and who are not (45). Also, a study in Thailand has examined the effect of religious actions of Buddhist and Muslim populations on prevalence, grade, and patterns of knee OA. This study reported that radiographical knee OA prevalence was significantly higher in the Buddhist population (85.62 to 70.67), and also, Buddhists had a tendency to have higher symptomatic knee OA prevalence (47.72 to 37.32). They have attributed this result to the Muslim population's early onset of performing namaz at childhood, reduction of pressure on knee cartilage, and diminution of tissue stiffness around knee with the help of excessive knee flexion (46). On the other hand, in the Antalya knee OA prevalence study (8), it was shown that performing namaz significantly increases knee OA rates. Authors have construed this result as compatible with Cooper et al.'s (47) report, which states that sitting more than 30 minutes increases risk for knee OA development. However, it is hard to evaluate the direct effects of crouching and bending movements in the course of namaz. Our findings were similar to those from the Antalya study, which suggests that regular prayer habit (namaz) increases SKO prevalence significantly. We also found that people performing namaz had a 2.6-times higher risk for SKO development than a control group (95% CI 1.1-6.2). It is assumed that gender, age, high levels of BMI, and pressure-amplifying effects of squatting movements that stimulate the cartilage destruction of knee joints may also be responsible for developing OA in a regular prayer habit (namaz) group.

There are studies about effects of smoking for increasing OA risk, but there are also some studies advocating the opposite and reporting protective effects for knee and hand OA, as well. Felson et al. (48) have reported that both male and female smokers had less OA development risk than the non-smoker group. They also suggested that the smoker population's low BMI and low amount of load taken by the knee could also decrease OA rates. Smoking habit could not be a solo risk factor for OA but behaves synergistically with other factors, such as lifestyle and habits of people (49). Another study reported that the protective effects of smoking might be due to nicotine, which upregulates glycosaminoglycan and collagen synthesis by chondrocytes (50). In a recent meta-analysis evaluating risk factors for knee OA (includes case-control and cohort studies), it was reported that smoking did have a slight protective effect for knee OA (unified OR 0.84; 95% CI 0.74-0.95) (29). Hart et al. (51) reported that smoking did not have any protective effect for hand OA in women. The Clearwater OA study (52), which evaluated 2505 women and men over 40 years of age, and an Israel study (53), which evaluated hand OA prevalence for 827 people, both reported that there was no significant protective effect of smoking for hand OA. The Antalya study in our country determined that smoking habit had a significant relationship with less symptomatic knee OA development, and this was attributed to the smoker population's low BMI (8). In our study, smokers were significantly less in the SKO group.

On the other hand, we found that SKO and SHaO prevalence was both significantly higher in women in the postmenopausal period, whereas there was no significant difference for

SHO. According to the observational studies, it was reported that hormone replacement therapy (HRT) after menopause could be protective for knee OA; however, some of these studies reported that this relation was not significant at all (54,55). A recent meta-analysis revealed that there was no positive correlation between hand, knee, and hip OA and exogenous hormone therapy. There is limited evidence for the protective influence of unmet estrogen usage for total hip replacement incidence (56). Similar to the literature, we found no relationship between HRT and SKO, SHaO, and SHO prevalence. When odds ratios were compared between the HRT group and control group, we found a ratio of 0.3 (95% CI 0.1-1.6), but this value did not significantly decrease the risk for OA.

In one of the studies about toilet type and OA, Yoshida et al. (57) reported a correlation between oriental style toilet and high knee OA prevalence in Japanese people. However, Kacar et al. (8) reported lack of a relationship between symptomatic knee OA and toilet type in the Antalya study. Our female population was using mostly European style toilets, and similar to the Kacar et al. (8) report, we did not find any relationship between symptomatic knee and hip OA with toilet style.

Cartilage and other joint tissues are resistible to regular joint loads physiologically (20). However, joint resistance decreases if this load bearing becomes excessive and frequent; then, this provokes OA development (58). Recent numerous studies show that both lifestyle and occupation have some effect on type or grade of OA involvement on specific joints (57,59). There are certain reports (60,61) stating that jobs requiring long times of knee bending and squatting increase the risk for knee OA in men. However, this was not verified by all studies (62). There are studies that show climbing stairs (job-related activity) as a risk factor for OA; yet, there are some studies that report the contrary, as well (61-64). In both genders, some studies show heavy lifting while squatting (at work) can be positively related with knee OA, but Coggon et al. (60) and Seidler et al. (62) report opposite results (61,63). A different study about hip OA in men shows a correlation with heavy lifting (64), while another study reports the opposite (65). When we look at the occupation distribution throughout our study group, we see that there is a significant difference between males and females; 80.3% of women were housewives, and 69.7% of men were workers. In the SKO, group housewives were first and workers were second in numbers. OA development risk was 2.4 times as high in the farmer population compared to workers, but this value does not increase SKO risk significantly. There was significantly low risk of SKO in housewives and the official job population when compared to workers. Also, it was determined that farmers in our country work, bending over from the lumber area instead of squatting.

Compressive forces that serve as a potential factor for knee injury happen to increase mostly while walking and going down the stairs (66). Compressive forces nearly increase twice as much while walking and going down the stairs. In a 2008 review that was carried out to examine the relationship between hip OA and risk factors, no correlation was found between climbing stairs and hip OA. Another review suggested a relation between knee OA and climbing stairs. This was attributed to the possible effect of a 6-fold increment of load bearing, which results in destruction of knee joints (67). We also found that subjects in our study group with a history of climbing and going down stairs also had higher SKO prevalence.

Repetitive loading is held responsible for OA development, as it induces cartilage damage. On the other hand, it is reported that repetitive loadings are responsible for asymptomatic osteophytes but not severe symptomatic knee OA (68). In our study, people who did not have SKO were physically more active than the general population.

One of the limitations of our study was the small number of patients older than 80. If we had many more SHaO and SHO patients, we could make a further analysis for determining risks. Heterogeneous distribution of the study group (immigrants from different sides of the country (Simav, Erzurum, Urfa) and from outside of the country) limited us to create a projection for the whole country.

Conclusion

Briefly, our study shows that symptomatic knee OA was widespread through the region we evaluated (12). We found that female gender, advanced age, BMI over 30 kg/m^2, and being in the postmenopausal period were risk factors for SKO. Low education level, being a non-smoker, regular prayer habit (namaz), climbing stairs at work, being a worker, and low level of physical exercise are risk factors for both SKO and SHaO. It seems obvious that it is possible to build an effective health policy about osteoarthritis by conducting enough studies with larger populations to determine risk factors for developing osteoarthritis.

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