Prevalence of osteoarthritis of the knee in a random population sample of people aged 40 and older

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Abstract

Introduction: Osteoarthritis is the osteoarticular disease with the highest prevalence worldwide. In industrialized countries, 80% of the population > 65 years suffers from it. **Objectives:** To determine the prevalence of symptomatic osteoarthritis of the knee in a random population sample, its associated variables and its impact on pain and functionality. **Methods:** Descriptive and multivariate logistic regression analysis carried out at the Cambre Health Center, A Coruña. A sample of 707 patients was included. Anthropometric variables, comorbidity and clinical examination of the knees were assessed. The validated WOMAC and Lequesne questionnaires were used to assess pain and functionality. **Results:** 56.3 % of the patients were females, and mean age was 61.75 years. The prevalence of symptomatic osteoarthritis in at least one knee was 29.3 %. People with osteoarthritis had higher scores in the pain, stiffness and functional capacity dimensions of the WOMAC questionnaire (30.0 ± 35.7 , 33.8 ± 40.5 and 25.4 ± 40.1 , respectively) and had higher scores in the Lequesne questionnaire as well (9.0 ± 8.8). **Conclusions:** A high prevalence of people with osteoarthritis has been determined, which is modified with gender, age and body mass index.

KEY WORDS: Osteoarthritis. Knee. Pain. Stiffness.

Introduction

Traditionally, the concept of osteoarthritis has been focused on articular cartilage degradation. However, in recent years, the concept of the disease has changed, and it involves the rest of the anatomical structures that make up the joint: subchondral bone, ligaments, meniscus, joint capsule, synovial membrane and periarticular muscle, with the joint being regarded as a neuromusculoskeletal unit.¹⁻⁴ Tissue injury mechanisms include mechanical and biological factors; in addition, osteoarthritis is a highly metabolically active disease.⁵⁻⁷

Osteoarthritis is the osteoarticular disease with the highest prevalence in the entire world. In industrialized countries, 80 % of the population older than 65 years suffer osteoarthritis⁸ and knee or hip involvement is the most common cause of ambulation disability in the elderly.⁹ In Spain, the symptomatic prevalence of

osteoarthritis of the knee in people older than 20 years is 10.2 % and that of symptomatic osteoarthritis of the hands is 6.2 %.¹⁰

There are numerous epidemiological studies on the prevalence of osteoarthritis in different populations, but their results are not easy to be generalized and compared due to the variability in the definition of the disease (clinical or radiographic criteria), selection biases (participants' age and gender), selected joints, difficulty in establishing early symptoms of the disease and diversity in population pain threshold.¹¹⁻¹³

Osteoarthritis clinical data usually appear after 40 years of age, with gradual onset and slow evolution, with differences according to sites and individuals. Pain is the cardinal symptom (of mechanical characteristics). Other signs and symptoms include joint stiffness (of short duration), joint deformity, crepitus, weakness or instability.¹⁴⁻¹⁶

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Tabla 1. General characteristics of the sample

Characteristic	n	Mean $\pm$ 2 SD	Median	Range
Age (years)	701	61.75 $\pm$ 23.32	63.00	42.0-91.0
Weight (kg)	702	75.36 $\pm$ 27.90	74.70	43.20-160.0
Height (cm)	703	160.77 $\pm$ 18.72	161.00	134.0-194.0
BMI (kg/m ²)	702	29.11 $\pm$ 9.32	28.67	19.13-64.1
Age-adjusted Charlson	666	2.25 $\pm$ 3.60	2.00	0.00-13.00
	n	%	IC 95 %	
Gender				
Male	309	43.7	39.98-47.43	
Female	398	56.3	52.57-60.02	
BMI categories (kg/m ²)				
Normal weight (18.5 $\geq$ < 25)	118	16.8	14.0-19.6	
Overweight (25 $\geq$ < 30)	315	44.9	41.1-48.6	
Obesity (BMI $\geq$ 30)	269	38.3	34.7-42.0	
Menopausia	305/391	78.0	73.77-82.24	
Smoker				
No	403	57.0	53.3-60.7	
Former smoker	201	28.4	25.0-31.8	
Yes	103	14.6	11.9-17.2	
HBP (SBP/DBP $\geq$ 140/90)				
No	478	69.2	65.7-72.7	
Yes	213	30.8	27.3-34.3	
Symptomatic osteoarthritis diagnosis				
Right knee	186/703	26.5	23.1-29.8	
Left knee	188/704	26.7	23.3-30.0	
At least one	206/702	29.3	25.9-32.8	
Hand	268/706	38.0	34.3-41.6	
ACR classification criteria				
Knee pain	232/703	33.0	29.4-36.5	
Age > 50 years	592/707	83.7	80.9-86.5	
Stiffness	177/704	25.1	21.8-28.4	
Crepitus	665/705	94.3	92.5-96.1	
Bone margins tenderness	264/704	37.5	33.8-41.1	
Hard consistency joint hypertrophy	30/705	4.3	2.7-5.8	
Absence of inflammation signs	699/705	99.1	98.4-99.9	
Knee surgery				
No	648/704	92.0	90.0-94.1	
Yes	56/704	8.0	5.9-10.0	

BMI = body mass index, HBP = high blood pressure, SBP = systolic blood pressure, DBP = diastolic blood pressure.

Taking into account the magnitude and impact of the disease, this research had the purpose to determine the prevalence of symptomatic osteoarthritis of the knee in a random population sample aged 40 and older, as well as the variables associated with its occurrence.

Method

Observational study on the prevalence of osteoarthritis in the municipality of Cambre, A Coruña, Galicia, Spain. Cambre inhabitants of 40 years of age or

older who granted their consent to participate in the study were included.

In this study, a sample size of 707 patients (309 men and 398 women) was obtained, which allowed to determine the prevalence of osteoarthritis of the knee in people aged 40 or older, taking into account the population of the Cambre municipality according to data of the National Institute of Statistics of Spain and after conducting a stratified random sampling by age groups (40 to 64 years and older than 65) and gender, through data of the health card, with a 95 % confidence level

($\alpha = 0.05$), an accuracy of $\pm 4\%$ and assuming an attrition percentage of 11 %.

Authorization of the Clinical Research Ethics Committee of Galicia was requested. Possible participants were contacted by postal mail, explaining the characteristics of the study. Subsequently, those who were interested received a telephone call to make an appointment at the Cambre Health Center. After having accepted to participate, in the visit to the health center, the patient was examined and information was collected.

Measurements and interventions

Sociodemographic (age, gender) and anthropometric variables (weight, height, body mass index [BMI]) were assessed, as well as high blood pressure (HBP), tobacco consumption, comorbidities (Charlson score), disease variables (American College of Rheumatology classification criteria and surgical history) and the WOMAC¹⁷ and Lequesne¹⁸ questionnaires for patient pain assessment and functional assessment. The former consists of 24 items that evaluate three dimensions (pain, stiffness and functionality) and the latter has 11, which assess pain, discomfort and functionality. Examination of the knee joints was carried out taking into account the American College of Rheumatology clinical criteria.^{19,20}

A descriptive analysis of the variables included in the study was carried out. Quantitative variables were expressed as the mean $\pm$ 2 SD, median and range; qualitative variables were expressed as frequencies and percentages, indicating their corresponding 95 % confidence interval. The association between qualitative variables was analyzed by means of chi-square or Fisher tests. The comparison of means was performed using Student's t-test or Mann-Whitney's U-test. Consistency between the questionnaires used for pain and functionality assessment was analyzed using Spearman's correlation coefficient. The variables associated with osteoarthritis of the knee were determined through logistic regression models.

Results

There was a slight predominance of women, with a mean age of 61.75 ± 23.32 years. There was a high prevalence of overweight (44.9 %) and obesity (38.3 %) recorded. The study sample showed a prevalence of smoking of 14.6 % and high blood pressure of 30.8 %. Age-adjusted median Charlson score was 2.0 (Table 1).

Table 2. Variables associated with the presence of osteoarthritis in at least one knee

Variable	Osteoarthritis in at least one knee		p	
	No	Yes		
	Mean $\pm$ 2 SD	Mean $\pm$ 2 SD		
Age	60.3 $\pm$ 23.6	64.9 $\pm$ 21.0	< 0.001	
Menopause age	49.3 $\pm$ 10.4	49.3 $\pm$ 10.8	0.979	
BMI	28.4 $\pm$ 8.8	30.8 $\pm$ 9.8	< 0.001	
Charlson score	2.0 $\pm$ 3.4	2.8 $\pm$ 3.8	< 0.001	
	n	%	n	%
Age group				
40-64 years	287	75.9	91	24.1
≥ 65 years	204	41.5	114	55.6
Gender				
Male	248	81.0	58	19.0
Female	248	62.6	148	37.4
Smoker				
No	255	63.7	145	36.3
Yes	241	79.8	61	20.2
BMI categories (kg/m ²)				
Normal weight ($18.5 \leq < 25$)	104	88.1	14	11.9
Overweight ($25 \leq < 30$)	229	73.6	82	26.4
Obesity (BMI ≥ 30)	159	59.3	109	40.7
Osteoarthritis of the hands				
No	353	81.0	83	19.0
Yes	143	54.0	122	46.0
HBP				
No	328	73.5	118	26.5
Yes	156	65.3	83	34.7

BMI = body mass index, HBP = high blood pressure.

According to the American College of Rheumatology diagnostic criteria, osteoarthritis symptomatic prevalence in at least one knee in the general sample was determined to be 29.3 %; the appearance of osteoarthritis in the hands (38.0 %) was more frequent. The most common signs and symptoms were inflammation absence, crepitus and pain (Table 1).

In the bivariate analysis, symptomatic osteoarthritis of the knee was significantly associated with the following variables (Table 2): age, gender, tobacco exposure, BMI, symptomatic osteoarthritis of the hand diagnosis and Charlson score. A history of high blood pressure was significantly associated with osteoarthritis of at least one knee.

Patients with osteoarthritis of the knee were older (64.9 ± 21.0 vs. 60.3 ± 23.6 years); osteoarthritis was more common in patients aged 65 or older. This pathology occurred more frequently in women (37.4 % vs.

Table 3. Association of pain, general status, age and symptoms with the presence of osteoarthritis in at least one knee

Variable	Osteoarthritis in at least one knee				p
	No		Yes		
	Mean ± SD		Mean ± SD		
Pain in the preceding week	2.66 ± 6.20		6.10 ± 5.30		< 0.001
Patient general status assessment	2.45 ± 3.44		4.78 ± 4.20		< 0.001
Observer assessment	2.03 ± 3.24		5.11 ± 4.00		< 0.001
	n	%	n	%	
Pain right knee					
No	470	94.8	1	0.5	< 0.001
Yes	26	5.2	205	99.5	
Age > 50 years					
No	105	20.3	10	5.3	< 0.001
Yes	411	79.7	178	94.7	
Right knee stiffness					
No	479	96.8	48	23.3	< 0.001
Yes	16	3.2	158	76.7	
Knee crepitus					
No	39	7.9	1	0.5	< 0.001
Yes	457	92.1	205	99.5	
Tenderness					
No	422	85.3	17	8.3	< 0.001
Yes	73	14.7	189	91.7	
Knee hypertrophy					
No	496	100	177	85.9	< 0.001
Yes	0	0	29	14.1	
Knee inflammation					
No	490	98.8	206	100	< 0.001
Yes	6	1.2	0	0	

19.0 %), in patients with symptomatic osteoarthritis of the hand (46.0 % vs. 19.0 %), with higher BMI and in non-smokers. In turn, a higher prevalence of osteoarthritis was observed in hypertensive patients (34.7 % vs. 26.5 %) and higher comorbidity values according to the Charlson score (2.8 ± 3.8 vs. 2.0 ± 3.4) (Table 2).

Of the patients without a diagnosis of symptomatic osteoarthritis, 5.2 % referred pain and 3.2 % stiffness in at least one knee, in comparison with 99.5 % and 76.7 % of patients with symptomatic osteoarthritis (Table 3).

Considering all variables, and adjusting a multivariate logistic regression model, the variables that were identified to have an independent effect associated with symptomatic osteoarthritis in at least one knee were age, gender and BMI classification. Women were at higher risk to develop symptomatic osteoarthritis of the knee (odds ratio [OR] = 2.85); the older the age, the higher the risk (OR = 1.03); and patients with

Table 4. Logistic regression model to determine the variables with an impact on the probability of symptomatic osteoarthritis of the knee

Variable	B	EoT	p	OR	95% CI
Gender (female)	1.047	0.187	< 0.001	2.849	1.974-4.112
Age	0.031	0.008	< 0.001	1.031	1.015-1.047
BMI 25-30 kg/m ²	1.079	0.321	< 0.001	2.942	1.570-5.514
BMI > 30 kg/m ²	1.582	0.320	< 0.001	4.866	2.600-9.108
Constant	-4.577	0.588	< 0.001	0.010	

BMI = body mass index, CI = confidence interval.

overweight (OR = 2.94) or obesity (OR = 4.87) had a higher risk than those with normal weight (Table 4).

Mean global score for the Lequesne knee questionnaire was 4.01 ± 4.59 (Table 5), and it was higher in patients with symptomatic osteoarthritis of the knee (8.97 ± 8.86 vs. 1.92 ± 5.28).

The dimension with the highest score was that of pain. According to the degree of severity as determined

Table 5. Lequesne and WOMAC index in at least one knee and both questionnaires

Indicator	Osteoarthritis in at least one knee			p
	Overall	No	Yes	
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	
Lequesne dimensions				
Pain	1.91 $\pm$ 4.82	0.79 $\pm$ 3.00	4.57 $\pm$ 4.08	< 0.001
Maximum distance walked	0.88 $\pm$ 2.22	0.60 $\pm$ 1.54	1.56 $\pm$ 2.92	< 0.001
ADL	1.22 $\pm$ 3.46	0.53 $\pm$ 2.02	2.84 $\pm$ 3.92	< 0.001
Total score	4.01 $\pm$ 9.18	1.92 $\pm$ 5.28	8.97 $\pm$ 8.86	< 0.001
WOMAC dimensions				
Pain	12.39 $\pm$ 35.20	4.98 $\pm$ 21.86	30.05 $\pm$ 35.70	< 0.001
Stiffness	13.65 $\pm$ 39.98	4.97 $\pm$ 23.72	33.86 $\pm$ 40.52	< 0.001
Functional capacity	10.74 $\pm$ 32.82	4.51 $\pm$ 18.16	25.41 $\pm$ 40.14	< 0.001
	n	%	95% CI	
Lequesne severity				
None	184	26.1	22.7-29.4	
Mild	265	37.5	33.9-41.2	
Moderate	76	10.8	8.4-13.1	
Severe	87	12.3	9.8-14.8	
Very severe	69	9.8	7.5-12.0	
Extremely severe	25	3.5	2.1-4.9	

ADL = activities of daily living.

by the questionnaire, 37.5 % showed slight alteration and 26.1 % were unaffected. In patients with symptomatic osteoarthritis of the knee, the WOMAC questionnaire standardized score was significantly higher in all its dimensions (pain, rigidity and functional capacity). A high, positive and significant correlation ($p < 0.001$) was observed between the Lequesne knee questionnaire and different dimensions of the WOMAC questionnaire, with the correlation with functional capacity standing out ($r = 0.888$) (Table 6).

Discussion

Regarding the general characteristics of the studied patients, there was a discrete predominance of women in relation to men, as it corresponds to the gender distribution in the population (56.3 % vs. 43.7 %). Mean age of the studied sample was 61.75 $\pm$ 23.32 years.

There was a high prevalence of overweight (44.9 %) and obesity (38.3 %). These results are consistent with those of other national and international epidemiological studies, taking into account the age group (people aged 40 and older).²¹⁻²⁴ According to the Charlson score, the most prevalent pathology was diabetes mellitus, with 10.7 %. Similar values have been found in other investigations.²⁵⁻²⁷ In this study, the American College of Rheumatology clinical criteria were used for the diagnosis of osteoarthritis, with the

Table 6. Correlation between Lequesne score and WOMAC questionnaire different domains

		WOMAC		
		Pain	Stiffness	Functional capacity
Lequesne	Correlation coefficient	0.821	0.645	0.888
	p	< 0.001	< 0.001	< 0.001

performance of X-rays being avoided in order to minimize the risk of radiation for the patients. A high prevalence of symptomatic osteoarthritis knee was determined (29.3 %), which was within the range observed in the literature.

In the Pereira systematic review,²⁸ as well as in the study carried out in Korea by Inje Kim et al.²⁹ and in the one by Lethbridge et al.³⁰, a prevalence of osteoarthritis of the knee between 18.9 and 37.3 % was estimated (by clinical and radiographic criteria), which are data consistent with the findings of our analysis. The review by Pereira²⁸ confirms the existence of high heterogeneity between different works. In line with the results of other investigations,³⁰⁻³² the prevalence of osteoarthritis of the knee was considerably higher in the female gender. We were able to determine that the variables that were independently associated with symptomatic osteoarthritis of the knee were age, gender (being a woman) and BMI.

The high prevalence of symptomatic osteoarthritis of the knee in our study can be explained by the inclusion of people with a high mean age and by the larger proportion of women than of men. These results are consistent with those reported in the reviewed literature,^{29,31-35} where a higher prevalence of osteoarthritis is observed in older patients and in the female gender.

In this study, validated questionnaires were used to assess pain and functional capacity in osteoarthritis (Lequesne index and WOMAC questionnaire), by means of which a high correlation between Lequesne total score and WOMAC different dimensions (pain, stiffness and functional capacity) were obtained

Numerous works highlight the involvement of the WOMAC questionnaire dimensions in patients with osteoarthritis of the knee and hip.³⁶⁻³⁸ The results derived from our study showed that patients with symptomatic osteoarthritis of the knee had a significantly higher scores in all WOMAC dimensions, which implies greater pain, stiffness and functional limitation, which were results that were expected. Similarly, other analyses^{39,40} have obtained worse results in the pain, stiffness and functional capacity dimensions in comparison with patients without osteoarthritis, just as it was found in our work.

Among the limitations of this research, we can mention that, to minimize the selection bias, a randomized study of the general population was carried out, where younger than 40 years' or immobilized patients were excluded. Information bias was minimized by using validated questionnaires and previously trained personnel to carry out the clinical examination. To minimize the confounding bias, variables were collected that might modify objective quality of life, pain, stiffness and functional capacity measurement parameters, such as patient comorbidity. In turn, the confounding effect was controlled using multivariate regression techniques.

Conclusions

We determined a high prevalence of people with osteoarthritis, which is modified by gender, age and BMI.

Patients with osteoarthritis had higher scores in the Lequesne questionnaire, in comparison with those without it. The most common degree of compromise was mild compromise.

WOMAC questionnaire scores in patients with osteoarthritis were clearly higher than in patients without osteoarthritis.

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