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ORIGINAL ARTICLE

Knee dysfunction in the general population and associated factors[☆]



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KEYWORDS

Knee joint;
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Abstract

Background: Knee joint dysfunction is present in 80% of people over 50 years of age, and in women there is a 1.5 times higher risk compared to men. Another important risk factor is obesity, which leads to a 3 times increase in the risk of suffering functional limitations in the joint.

The aim of this study was to determine knee joint dysfunction and the associated factors.

Material and methods: An analytical and descriptive study was conducted on 218 individuals older than 50 years of age in a primary care centre. A physical examination was performed on each patient, and the Western Ontario and McMaster Universities Osteoarthritis Index questionnaire was applied to them all. Logistic regression analysis was used to determine the association between age, gender, body mass index, and knee function. ANOVA was used to compare the means of the Western Ontario and McMaster Universities Osteoarthritis Index scores and body mass index measurements. A $p < 0.05$ was considered statistically significant.

Results: The mean age was 64.27 years (SD 10.43). An OR of 4.50 was obtained for having a disability in people over 65 years of age, 2.90 in obese people, and 2.02 in women. The mean scores in the 3 domains of Western Ontario and McMaster Universities Osteoarthritis Index were higher as the body mass index increased.

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PALABRAS CLAVE

Articulación de la rodilla;
Índice de masa corporal;
Género;
Western Ontario and McMaster Universities
Osteoarthritis Index

Conclusions: Women have greater disability than men, becoming more evident in older ages, and other risk of joint dysfunction increases up 3 times in obese patients.

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Disfuncionalidad de rodilla en la población general y factores asociados**Resumen**

Antecedentes: La disfunción articular de rodilla se presenta hasta en el 80% de las personas mayores de 50 años, y en mujeres el riesgo aumenta 1.5 veces más en comparación con los hombres; otro factor de riesgo importante es la obesidad, que aumenta hasta 3 veces más el riesgo de presentar limitación funcional.

El objetivo de este estudio fue: determinar la disfuncionalidad articular de rodilla y los factores asociados.

Material y métodos: Estudio descriptivo analítico que incluyó 218 personas mayores de 50 años, llevado a cabo en un centro de atención primaria. A los participantes se les realizó una exploración física y se les aplicó el cuestionario Western Ontario and McMaster Universities Osteoarthritis Index. Para determinar la asociación entre edad, género, índice de masa corporal y funcionalidad de la rodilla se aplicó un análisis de regresión logística, y para comparar las medias de las dimensiones del Western Ontario and McMaster Universities Osteoarthritis Index y el índice de masa corporal se utilizó el ANOVA. Se consideró un valor de $p < 0.05$ como estadísticamente significativo.

Resultados: La edad media fue de 64.27 años (DE 10.43). Se obtuvo una OR para presentar discapacidad de 4.50 en personas mayores de 65 años, 2.90 en obesos y 2.02 en mujeres, y las puntuaciones medias en los 3 dominios del Western Ontario and McMaster Universities Osteoarthritis Index fueron más altas conforme se incrementaba el índice de masa corporal.

Conclusiones: Las mujeres presentan mayor discapacidad que los hombres, haciéndose más evidente en edades avanzadas, y el riesgo de disfunción articular aumenta hasta 3 veces más en sujetos con obesidad.

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Background

Functional limitations of the knee are consequential to a series of events (progressive deterioration of the articular cartilage, alteration in the subchondral bone, changes in soft tissues and progressive deformity of articulation) which condition pain and reduce quality of life.¹⁻⁵ It has been estimated that around 10–25% of people over 55 have incapacitating symptoms and of these a quarter are severely incapacitated.⁶⁻⁹

Among the main associated factors are: gender, age and body mass index (BMI). The National Health and Nutrition Examination Survey reported that chronic pain and articular limitation presented in up to 80% of people over 55,¹⁰ compared with 0.1% in people aged between 25 and 34.¹¹ Other studies have demonstrated that obesity increases the risk of developing degenerative processes in the knee threefold,^{12,13} and it has been observed that a 5 kg weight increase increases the risk of degenerative processes in the knee by 35%, leading to functional limitations in the joint¹⁴; furthermore, a cohort study demonstrated that a BMI over

30 kg/m² is a determining factor in knee pain, regardless of radiologic severity. Obesity is now considered as a public health issue in both Mexico and worldwide.¹⁵ Another factor associated with functional limitation of the knee is being a female,¹⁰ since it has been shown that a 1.57 risk presents in women aged 45–54, compared with men of the same age and in women aged between 65 and 74 this risk increases to 2.14.¹⁶

At present, in Mexico, there are no studies which measure the articular dysfunction in the general population and its associated factors, specifically obesity, which is a modifiable risk factor. Considering that in Mexico, abdominal obesity presents in 74% of people over 30,¹⁷ it is of the utmost importance that a study be conducted to determine the impact of BMI on knee function in order that in the future prevention strategies may be established to reduce the articular incapacity risk secondary to obesity.

The aim of our study was to determine knee joint dysfunction and the associated factors in a primary care centre (Unidad de Medicina Familiar N° 2 del Instituto Mexicano del Seguro Social).

Material and methods

In the above mentioned Primary Care centre a descriptive, analytical and transversal study was conducted, from May 12 to September 30, 2014, with prior authorisation from the Local Research Committee. Individuals were recruited in the waiting room.

Inclusion criteria were as follows: men and women over 50, with any BMI. Those people who had already undergone surgical knee treatment or had an inflammatory process in the knee, amputation of one or both legs and those who did not complete the questionnaires were excluded from the study. Once they decided to participate in the study the participants filled out their medical history, were given a physical examination and were asked to fill out the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) self-administered questionnaire. Each participant was given a triptych with leg strengthening exercises and general recommendation for knee care, for the purpose of preventing or lessening knee symptoms in study participants.

In order to calculate sample size we used the percentage gap formula. Age was considered a risk factor for dysfunction with a minimum difference at 19% with a α of 95% and a β of 80%, obtaining a sample of 106 individuals per group.

There were 3 age group categories: ≤ 64 and ≥ 65 ; BMI was classified into 3 groups: normal ($< 25 \text{ kg/m}^2$), overweight ($25\text{--}29.9 \text{ kg/m}^2$) and obese ($> 30 \text{ kg/m}^2$); functionality of the knee was measured with the WOMAC questionnaire, a specific questionnaire for osteoarthritis of the knee or hip, which consisted of 24 questions grouped into 3 dimensions: pain (5 items), stiffness (2 items) and functionality (17 items). The Likert version with 5 response levels for each level of intensity was used (none, slight, moderate, severe, or extreme), which was numbered from 0 to 4. Scores were standardised from 0 to 100, where the higher the score, the greater the problem. The overall scores considered the 3 dimensions and this classification was used to classify the subjects as asymptomatic (WOMAC < 7) and subjects with symptomatology (WOMAC > 7), in keeping with what was reported by other authors.^{18,19}

Statistical analysis

Descriptive analysis was carried out, and central and disperse tendency measures were used for the quantitative variables. For qualitative analysis absolute and relative frequencies were used.

Inferential analysis: bivariate logistic regression was used to analyse the association between age, gender, BMI and knee function. ANOVA was used to compare the means of the WOMAC scores and BMI measurements. A $p \leq 0.05$ was considered statistically significant.

Results

240 individuals were invited to take part in the study, 218 of whom accepted; response rate was 90.1%. 218 subjects who met the inclusion criteria were included. The mean age of patients was 64.27 (SD 10.43), with a predominance of females (58.3%; $n = 127$). Regarding BMI, overweight

Table 1 General characteristics ($n = 218$).

	<i>n</i> (%)
<i>Gender</i>	
Male	91 (42)
Female	127 (58)
<i>Age</i>	
≤ 64	104 (48)
≥ 65	114 (52)
<i>BMI</i>	
Normal	64 (29)
Overweight	87 (40)
Obesity	67 (31)

BMI: body mass index.

predominated. Demographic characteristics are described in Table 1.

With regard to the presence of functional limitation, this was associated with BMI, with being over the age of 65 and with females (Table 2).

Analysis between the different BMI categories took place and each of the dimensions assessed by WOMAC, with a higher score being found – indicative of dysfunction – in obese and overweight patients, compared with those of normal weight, with statistically significant differences found (Table 3).

Discussion

In our study we found there was a statistically significant association between age, the female sex, and BMI with knee function as measured by the WOMAC questionnaire.

One European study reported that the incidence of articular dysfunction of the knee was strongly associated with an age above 50, the female sex and a higher BMI.²⁰

This research study found that age is an important factor for the presentation of pain and dysfunction in the knee. Schouten et al.²¹ found that people over 60 presented an odds ratio (OR) of 3.84 (CI of 95%: 1.10–13.4), compared with a population under 49, for the presentation of pain and dysfunction secondary to loss of articular cartilage. A systematic review published in 2011²² reported that age is a predictor of important progression for the development of pain and knee dysfunction, with an OR of 1.34 (CI of 95%: 1.15–1.57). The above mentioned coincides with our outcome.

Another study reported a major dysfunction of the knee in women compared with men, with an OR of 1.57 in people aged 45–54 years of age and of 2.14 in patients aged from 65 to 74.¹⁶ In one meta-analysis which included 46 studies it was reported that the female sex is one of the main factors for the appearance of pain and dysfunction in the knee in the adult population, reporting an OR of 2.66 (CI of 95%: 2.15–3.28).²³ In Mexico a prevalence of osteoarthritis higher in women than in men has been reported.²⁴ Previous results coincide with those obtained in our study.

In Australia it was found that in patients with a knee osteoarthritis diagnosis, the score associated with articular dysfunction directly increased with BMI, and pain averages

Table 2 Factors associated with knee dysfunction.

	Bivariate analysis		Multivariate analysis	
	OR	CI 95%	OR	CI 95%
Age > 6	3.33	(1.7–6.49)	4.59	(2.21–9.55)
Overweight	1.02	(0.46–2.27)	1.03	(0.43–2.32)
Obesity	2.33	(1.06–5.11)	2.90	(1.22–6.85)
Female sex	1.92	(1.01–3.68)	2.02	(1.06–4.08)

CI: confidence interval; OR: odds ratio.

Table 3 Association of dysfunction with body mass index.

BMI	Pain	Stiffness	Functional ability
Normal (average $\pm$ SD)	13.5 $\pm$ 22.91	11.91 $\pm$ 20.58	18.64 $\pm$ 24.13
Overweight (mean $\pm$ SD)	14.59 $\pm$ 15.44	12.64 $\pm$ 18.13	16.12 $\pm$ 16.07
Obesity (mean $\pm$ SD)	25.67 $\pm$ 24.40	23.50 $\pm$ 23.78	28.06 $\pm$ 25.20
<i>p</i>	0.001	0.001	0.003

SD: standard deviation; BMI: body mass index.

were higher in patients with obesity (40.1) compared with overweight patients (24) and normal BMI (23.4), and with the same tendency in other WOMAC areas.¹⁹

Doctor Elbaz et al.²⁵ found a statistically significant association between symptomatology and articular function of the knee assessed by WOMAC and BMI, finding there was a progressive increase in all WOMAC functions in keeping with the increase of BMI. In our study we found very similar characteristics. The highest averages in WOMAC pain, stiffness and function were found in patients who were overweight and obese.

Another systematic review reported that obesity is a very important risk factor in the articular dysfunction with a dose-response ratio. In other words, the higher the BMI, the bigger the risk of suffering from arthrosis and incapacity. This review included 12 observational studies, taking a BMI of 22.5 as a control group. It was found that with a BMI of 25 there is an OR of 1.59 (CI 95%: 1.34–1.81), for BMI of 30, an OR of 3.55 (CI 95%: 2.51–5.11), and for a BMI of 35, an OR of 7.45 times greater risk of suffering from osteoarthritis of the knee (CI 95%: 4.19–13.13).²⁶

Doctors Ackerman and Osborne¹⁹ found that the prevalence of pain and dysfunction was more frequent in overweight and obese patients. 16.48% of people with normal weight presented pain and dysfunction, 29.67% of people who were overweight and 53.85% of those who were obese.

One study of cases and controls found that the patients who presented with obesity had an OR of 2.8 (CI 95%: 1.05–7.34) compared with those with a normal BMI.¹²

In our study we found similar tendencies: 36% of patient with normal BMI, 47% of patients were overweight and 73% presented obesity which showed dysfunction. As a result of the above, it is recommendable in patients with modifiable risk factors mainly a BMI > 30 m/kg², to create multidisciplinary early prevention strategies against obesity such as physical activity and healthy diet to reduce BMI and slow down the degenerative process and the articular symptoms.

Conclusions

Symptoms and articular dysfunction of the knee directly increase with BMI, age and when the patient is a female, resulting in considerable health risk factors for the presentation of dysfunction in this joint.

Conflict of interests

The authors have no conflict of interests to declare.

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