Rev Esp Cardiol. 2011;64(1):63–66

Brief report

Obesity in Castile and Leon, Spain: Epidemiology and Association With Other Cardiovascular Risk Factors

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ARTICLE INFO

Article history:
Received 13 May 2009
Accepted 28 January 2010
Available online 17 December 2010

Keywords:
Obesity
Cardiovascular risk factors
Epidemiology

ABSTRACT

A cross-sectional study of obesity in a random sample of 4012 individuals aged ≥15 years in Castile and Leon, Spain, was carried out. The prevalence of obesity (i.e. a body mass index ≥30 kg/m^2) and abdominal obesity (i.e. a waist circumference >102 cm in males or >88 cm in females) was determined and associations between both types of obesity and other cardiovascular risk factors were investigated. The overall prevalence of obesity was 21.7% (95% confidence interval [CI], 20.3%–23.2%): it was higher in women, at 23.2% (95% CI, 20.9%–25.5%), than in men, at 20.4% (95% CI, 18.0%–22.7%). The prevalence of abdominal obesity was 36.7% (95% CI, 34.6%–38.9%): again it was higher in women, at 50.1% (95% CI, 47%–53.1%) than in men, at 22.8% (95% CI, 20.3%–25.2%). Associations were found between obesity and all classic cardiovascular risk factors, except smoking. The 10-year Systematic Coronary Risk Evaluation (SCORE) and Framingham risk scores were higher in obese individuals.

Patrón epidemiológico de la obesidad en Castilla y León y su relación con otros factores de riesgo de enfermedad cardiovascular

Palabras clave:
Obesidad
Factores de riesgo cardiovascular
Epidemiología

RESUMEN

Estudio transversal de la obesidad en una muestra aleatoria de 4.012 personas de edad ≥ 15 años en Castilla y León. Se estimó la prevalencia de obesidad (índice de masa corporal ≥ 30) y de obesidad abdominal (cintura > 102 cm en varones y > 88 cm en mujeres) y se calculó la relación de ambos tipos de obesidad con otros factores de riesgo cardiovascular. La prevalencia de obesidad fue del 21,7% (intervalo de confianza [IC] del 95%, 20,3%-23,2%), mayor en mujeres —23,2% (IC del 95%, 20,9%-25,5%) que en varones —20,4% (IC del 95%, 18%-22,7%)—. La prevalencia de obesidad abdominal fue del 36,7% (IC del 95%, 34,6%-38,9%), mayor también en mujeres —50,1% (IC del 95%, 47%-53,1%)— que en varones —22,8% (IC del 95%, 20,3%-25,2%). Todos los factores de riesgo cardiovascular, excepto el tabaquismo, estuvieron asociados a la obesidad. El riesgo SCORE y Framingham a 10 años fue superior en obesos.

INTRODUCTION

Obesity is a serious public health problem and has a high prevalence in the developed world.[1] It raises mortality[2] and diminishes life-expectancy and quality of life, especially in young adults.[3,4] In Castile and Leon, Spain, the 2003 Regional Health Survey found that 35.9% of the population were overweight, which is similar to the Spanish mean, and that 11.7% were obese, which is below the national mean.[5]

Along with high blood pressure, diabetes mellitus, hyperlipidemia and smoking,[4,6] excess weight is recognized as having contributed to the increased prevalence of ischemic vascular disease,[7,8] either directly or through interactions with other risk factors.

However, substantial doubt remains about the real significance of obesity in the genesis of cardiovascular disease and about the extent to which diet and lifestyle changes influence the different types of obesity, when analyzed by age, gender, or the environment in which the population lives (i.e. rural or urban).

In the present study, we investigated indicators of obesity in the population aged ≥15 years in Castile and Leon, Spain, and studied the relationship between obesity and other cardiovascular risk factors.

METHODS

Our data were obtained from the Study of Cardiovascular Risk in Castile and Leon, which was a descriptive study carried out in

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1885-5857/$ – see front matter
doi:10.1016/j.rec.2010.01.001

collaboration with primary care professionals in 2004 in a sample of the population aged ≥15 years. The sample was stratified by healthcare area and by residence in a rural or urban–semiurban area. The study design and general results have been published elsewhere.[9,10]

First, a simple random sample of physicians was selected. Then, a random sample of patients registered with these physicians was selected and 450 individuals from each of 11 healthcare areas were enrolled in the study. The sample size was calculated to give $p = 50\%$ and an error of 5% with an estimated 20% nonresponders. The final sample consisted of 4012 individuals.

We reviewed each individual's clinical history, measured their blood pressure, weight, height, and waist circumference, and took a blood sample. Physical examinations were performed with individuals barefoot and in underclothes. Waist circumference was measured in supine decubitus by passing a tape measure around the body at the point where the abdominal circumference was greatest.

Obesity was defined as a body mass index (BMI) ≥30 kg/m^2,[11] morbid obesity as a BMI ≥40 kg/m^2, and abdominal obesity (AO) as an abdominal circumference >102 cm in men or >88 cm in women. Individuals were considered to have high blood pressure if it was reported in their clinical record, they were receiving treatment, or they had a systolic arterial pressure ≥140 mmHg or a diastolic arterial pressure ≥90 mmHg. Individuals were considered diabetic if it was reported in their clinical record or their baseline glucose level was >125 mg/dL. Individuals were considered to have dyslipidemia if it was reported in their clinical record, they were receiving treatment, or their total cholesterol level was ≥250 mg/dL. Individuals were considered smokers if they consumed ≥1 cigarette per day.

We made precise estimates of the prevalence of obesity at regular intervals. We used the sample mean proposed in the study design and the ratio estimator $Y_s = t_y\pi/N$, where $t_y\pi$ was the estimator for the whole of the variable under study and N was the estimator for the population total. Rates for men and women and for rural and urban–semiurban environments were age-adjusted, taking the study design estimate of the population total as the standard population. We constructed distributions and tables with the sample data.

We described the relationships between obesity and estimated parameters for the population as a whole, and studied the relationships between obesity and a history of myocardial infarction and between obesity and a history of stroke. Moreover, we calculated Systematic Coronary Risk Evaluation (SCORE) and Framingham risk indices using the models described by Conroy et al.[12] and Wilson et al.,[13] respectively.

RESULTS

Prevalence of Obesity

The estimated prevalence of obesity (i.e. a BMI ≥30 kg/m^2) was 21.7% (95% confidence interval [CI], 20.3%–23.2%); it was higher in women than in men, at 23.2% (95% CI, 20.9%–25.5%) and 20.4% (95% CI, 18.0%–22.7%), respectively. The prevalence was highest in individuals aged 60–64 years; rates were higher in men <50 years and in women >50 years. In men, the prevalence was highest at 55–59 years and in women, at 60–64 years; above the latter age range, the prevalence in women was double that in men (Table 1).

The prevalence of morbid obesity (i.e. a BMI ≥40 kg/m^2) was 1.4% (1.0% in men and 1.9% in women). Morbid obesity was most prevalent at 50–54 years, when the prevalence in women was highest; the maximum prevalence in men occurred at 45–49 years.

In men, the age-adjusted rates of obesity and morbid obesity were 18.8% and 0.9%, respectively, which was significantly lower than in women, at 22.5% and 2.0%, respectively.

Obesity was more prevalent in rural areas (26.2%; 95% CI, 23.4%–28.1%) than urban–semiurban areas (18.7%; 95% CI, 16.3%–20.1%) and these differences were maintained after age-adjustment (24.6% and 18.1%, respectively).

The estimated prevalence of AO was 36.7% (95% CI, 34.6%–38.9%); it was higher in women (50.1%; 95% CI, 47.0%–53.1%) than in men (22.8%; 95% CI, 20.3%–25.2%). The prevalence was highest in women aged 60–74 years (Table 2).

As with the BMI estimate of obesity, we found that AO was more prevalent in rural areas (40.1%; 95% CI, 36.6%–43.7%) than urban–semiurban areas (34.4%; 95% CI, 31.6%–37.1%) and these differences were maintained after age-adjustment.

Relationship of Obesity to Other Cardiovascular Risk Factors

The relationships between obesity and other cardiovascular risk factors are shown in Table 3. High blood pressure was more common among obese (65.7%) and overweight individuals (45.1%) than among those with a normal BMI (21.0%) and these differences were statistically significant. Results for AO were similar. Diabetes mellitus was more frequent among obese (17.3%) than normal weight individuals (4.7%).

We found smaller differences in hypercholesterolemia for the different levels of obesity based on BMI and AO, although these differences were also statistically significant. In contrast, we found fewer smokers and more ex-smokers among obese individuals.

Table 1
Estimated Prevalence of Obesity and Morbid Obesity by Age Group and Gender

	Obesity (BMI ≥30 kg/m^2)			Morbid Obesity (BMI ≥40 kg/m^2)		
	Total	Men	Women	Total	Men	Women
Total	21.7 (20.3–23.2)	20.4 (18–22.7)	23.2 (20.9–25.5)	1.4 (1.0–1.9)	1.0 (0.3–1.8)	1.9 (1.2–2.5)
Age (years)						
15–34	9.8 (7.8–11.9)	11.4 (8.4–14.3)	8.5 (5.6–11.3)	0.4 (0–0.9)	0.0	0.8 (0–1.7)
35–39	14.4 (10.8–18)	18.5 (12.8–24.2)	11.0 (6.4–15.5)	0.3 (0–0.7)	0.0	0.7 (0–1.5)
40–44	20.7 (15.7–25.7)	23.4 (17.3–29.6)	19.2 (12.2–26.2)	2.3 (0.3–4.2)	0.8 (0–2.1)	3.6 (0–7.2)
45–49	19.3 (13.3–25.2)	25.4 (18–32.7)	12.2 (6.6–17.9)	2.1 (0–4.2)	4.1 (0–8.3)	0.1 (0–0.4)
50–54	26.3 (20–32.6)	18.7 (12.7–24.6)	34.2 (26.4–42.1)	4.6 (1.5–7.7)	0.8 (0–2.7)	9.3 (5–13.6)
55–59	33.9 (28.1–39.6)	35.3 (26.2–44.3)	33.5 (27–40)	3.0 (0.5–5.6)	1.5 (0–3.6)	3.8 (0.5–7.2)
60–64	36.9 (30.8–43)	29.9 (22–37.9)	43.4 (34.1–52.6)	1.0 (0–2.1)	1.4 (0–3.6)	0.6 (0–1.5)
65–69	26.1 (20.9–31.2)	18.0 (12.7–23.4)	33.2 (24.0–42.5)	0.8 (0–1.9)	0.0	1.6 (0–4.1)
70–74	29.3 (22.8–35.3)	16.6 (9.2–24)	37.8 (29.3–46.3)	2.6 (0.3–4.8)	3.1 (0–6.7)	2.0 (0–4.3)
≥75	26.5 (22.3–30.8)	17.2 (10.2–24.3)	34.9 (28.2–41.7)	1.2 (0.4–2)	0.4 (0–1.3)	2.0 (0.8–3.2)

BMI, body mass index.
Data express % and 95% CI.

Table 2
Estimated Prevalence of Abdominal Obesity* by Age Group and Gender

	Total	Men	Women
Total	36.7 (34.6–38.9)	22.8 (20.3–25.2)	50.1 (47.0–53.1)
Age (years)			
15–34	15.2 (12.6–17.7)	9.8 (6.5–13)	20.6 (17.1–24)
35–39	22.2 (17.1–27.2)	15.9 (9.6–22.3)	28.5 (21.0–35.9)
40–44	28.3 (22.7–33.9)	17.2 (12.0–22.3)	37.9 (30.0–45.9)
45–49	23.7 (17.4–29.9)	21.2 (1.8–28.5)	30.2 (22.0–38.3)
50–54	41.8 (34.5–49.0)	24.5 (15.5–33.4)	58.1 (51.3–64.9)
55–59	54.2 (47.8–60.7)	37.6 (29.2–45.9)	65.9 (58.8–72.9)
60–64	55.0 (48.8–61.2)	31.0 (23.2–38.8)	80.5 (73.9–87.1)
65–69	54.1 (47–61.2)	33.6 (25.1–42.0)	77.7 (69.2–86.2)
70–74	59.6 (52.2–67.0)	23.5 (15.1–32.0)	86.7 (81.2–92.2)
≥75	54.5 (49–59.9)	28.5 (22.6–34.5)	76.7 (70.6–82.8)

Data express % and 95% CI.
*Abdominal obesity was defined as a waist circumference >102 cm in men or >88 cm in women.

Table 3
Prevalence of Cardiovascular Risk Factors or a High Cardiovascular Risk Index According to body mass index (BMI) Measures of Obesity and Abdominal Obesity (AO)

	Total Prevalence[a]	Prevalence According to BMI Measures of Obesity				Prevalence According to AO		
		Normal Weight	Overweight	Obesity	*P*[b]	Normal	Obese	*P*[b]
High blood pressure (%)	38.7	21.0	45.1	65.7	<.0001	28.1	61.8	<.0001
Diabetes mellitus (%)	8.8	4.7	10.4	17.3	<.0001	6.1	15.7	<.0001
Hypercholesterolemia (%)	28.9	20.1	33.3	38.6	<.0001	23.6	39.1	<.0001
Smoking (%)					<.0001			<.0001
Non-smokers (%)	53.5	53.3	52.6	60.1		47.1	66.1	
Ex-smokers (%)	21.8	17.5	25.5	22.1		24.2	18.3	
Smokers (%)	24.7	29.2	21.9	17.8		28.7	15.6	
History of myocardial infarction (%)	4.4	2.6	5.2	5.8	<.0001	3.4	5.9	<.0001
History of ACVA (%)	2.0	1.4	2.5	2.1	NS	1.8	2.4	NS
SCORE index ≥5% (%)	7.4	3.7	8.5	12.0	<.0001	6.9	9.6	<.0001
Framingham score ≥20% (%)	9.3	3.9	11.9	15.7	<.0001	9.0	12.2	<.0001

Abbreviations: ACVA, acute cerebrovascular accident; SCORE, Systematic Coronary Risk Evaluation.
[a] Population-wide estimates.
[b] Chi-squared test.

We found that a history of stroke was more frequent in overweight and obese individuals, and the prevalence of myocardial infarction in these groups was double that in individuals with a normal BMI. The differences for stroke were not significant.

A high 10-year risk of death from stoke (i.e. a SCORE index ≥5%) was more common among obese (12%) than overweight (8.0%) or normal weight (3.7%) individuals. We found similar differences for a high 10-year risk of ischemic heart disease (i.e. a Framingham index score ≥20%): 15.7% in obese, 11.9% in overweight and 3.9% in normal weight individuals. We found similar differences for AO.

DISCUSSION

The BMI and waist circumference are the most widely used parameters for determining obesity because they are easily obtained.[2,14]

Almost half the men and one-third of the women in our study were overweight and one in five was obese, which is compatible with the results of other national and multinational studies.[15–17]

The prevalence of obesity was less with the BMI measure (21.7%) than with the waist circumference measure (36.7%) and these differences were greater in women.

We found strong relationships between obesity and high blood pressure, and between obesity and diabetes mellitus. The relationship with hypercholesterolemia was much weaker. The lower number of smokers among obese individuals points to a reduction in cardiovascular risk factors in this group, and there was an inverse relationship between age and smoking.

There was no significant increase in the risk of ischemic vascular disease among obese or overweight individuals, which indicates that the risk of a cardiovascular event may be associated with a not particularly high BMI, or that individuals who had had an ischemic episode maintained a degree of control over their weight. In contrast, the prospective estimated risk (i.e. the population with a SCORE index ≥5% or a Framingham score ≥20%) increased significantly with overweight, obesity and AO.

The high prevalence of obesity could be related to the fact that neither the population as a whole nor healthcare professionals regard obesity as an illness. Instead, they see it as an imprecise risk factor that is more closely related with aesthetic concerns than with anthropometric measures. The perception of the level of obesity varied with how it was measured and this perception conditioned the attitude professionals and patients adopted towards the prevention of cardiovascular disease and the control of total cardiovascular risk.

CONFLICTS OF INTEREST

The authors state that they have no conflicts of interest.

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