

Original

Life-style factors associated with overweight and obesity among Spanish adults

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Abstract

Objectives: To assess the relationship between life styles and eating habits with the overweight and obesity prevalence in a Spanish adult population.

Methods: A population-based, cross-sectional study conducted on 2640 subjects older than 15 years, in Cádiz (Spain). Surveys were conducted in subjects' homes to obtain life styles, eating habits, and anthropometric data. Logistic regression has been used to study the association between the life style variables and overweight and obesity.

Results: Prevalence of overweight and obesity in Cádiz is 37% and 17%, respectively; higher in males and increases with age. BMI has an inverse relationship with educational level (PR = 2.3, 1.57-2.38). The highest levels of obesity are associated with daily alcohol consumption (PR = 1.39, 1.29-1.50), greater consumption of television, and sedentary pursuit (PR 1.5, 1.07-1.24).

A lower prevalence of obesity is observed among those with active physical activity (10.9% vs 21.6%), with differences between sex. Following a slimming diet is more frequent in the obese and in women but dedicate more hours than men to passive activities. In men is greater the consumption of alcohol, high energy foods and snacks.

Overweight and obesity is associated with the male sex (OR = 3.35 2.75-4.07), high consumption of alcohol (OR = 1.38 1.03-1.86) and watching television (OR = 1.52 1.11-2.07), and foods likes bread and cereals (OR = 1.47 1.13-1.91). Exercise activities is a protective factor (OR = 0.76 0.63-0.98).

Conclusions: Life styles factors associated with overweight and obesity present different patterns in men and women and is necessary to understand them to identify areas for behavioural intervention in overweight and obesity patients.

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Key words: Obesity. Nutrition. Assessment. Life style. Epidemiology. Adult. Nutrition disorders

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ESTILOS DE VIDA ASOCIADOS CON SOBREPESO Y OBESIDAD EN ADULTOS ESPAÑOLES

Resumen

Objetivo: Valorar la relación existente entre estilos de vida y hábitos alimentarios con la prevalencia de sobrepeso y obesidad en una población adulta española.

Método: Estudio transversal de base poblacional realizado en 2.640 adultos mayores de 15 años en Cádiz (España). El estudio se llevó a cabo en el domicilio de los sujetos, recogiendo mediante una encuesta los hábitos alimentarios y características de los estilos de vida.

Resultados: La prevalencia de sobrepeso y obesidad en Cádiz es de 37% y 17% respectivamente, mayor en varones e incrementándose con la edad. El IMC muestra una relación inversa con el nivel educativo (RP = 2,3, 1,57-2,38). Los mayores niveles de obesidad se asocian al consumo diario de alcohol (RP = 1,39, 1,29-1,50), mayor consumo de televisión y hábitos sedentarios (RP = 1,5, 1,07-1,24). Las menores cifras de prevalencia de obesidad se observan en los sujetos con una mayor actividad física (10,9% frente a 21,6%), aunque con diferencias entre sexos. Las mujeres dedican más horas que los hombres a actividades pasivas. Seguir dietas de adelgazamientos es mas frecuente en sujetos obesos y en mujeres. En hombres es mayor el consumo de alcohol, alimentos con elevado contenido calórico y comer entre horas. La presencia de sobrepeso y la obesidad se asocia con el sexo masculino (OR = 3,35 2,75-4,07), elevado consumo de alcohol (OR = 1,38 1,03-1,86) y televisión (OR = 1,52 1,11-2,07), y con mayores consumos de alimentos del grupo de cereales y pan (OR = 1,47 1,13-1,91). La actividad física se comporta como factor protector (OR = 0,76 0,63-0,98).

Conclusiones: Los estilos de vida asociados con el sobrepeso y la obesidad presentan diferentes patrones en hombres y mujeres. Es necesario estudiarlos para identificar áreas de intervención en pacientes con sobrepeso y obesidad.

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Palabras clave: Obesidad. Evaluación nutricional. Estilo de vida. Epidemiología. Adulto. Trastornos nutricionales.

Introduction

Obesity is increasing continuously, unleashing a veritable epidemic in the developed countries,¹ a fact that seems to be related, on the one hand, to the increased consumption of foods with greater calorie content, such as those present in «fast food» or convenience meals, and on the other to more sedentary life styles.^{2,3}

Obesity is not only considered as a disease in itself, but it also gives rise to and aggravates many others, and is thus known to be a risk factor for certain chronic diseases⁴, in particular being closely associated with pathologies like diabetes, cardiovascular diseases, osteoporosis and certain types of cancer, pathologies that present high rates of morbidity and mortality in Europe and the other developed countries.^{5,6}

In Europe the prevalence of obesity is higher in the Mediterranean and East European countries; however the USA and several Latin American countries present even higher prevalences of obesity.⁷ In Spain over the last 15 years there has been an increase of 2.2% in the prevalence of obesity. The currently estimated prevalence of obesity and global weight overload (overweight or obesity) for the Spanish population is 14.5% and 53.5%, respectively;⁸ the proportion of subjects with obesity is higher in the regions of the southeast of the country; thus Andalusia is notable as being amongst the highest, with values reaching 21.5%.^{6,7}

Personal characteristics such as psychological factors, socioeconomic status, levels of education and life styles can determine eating behaviours leading to a greater risk of overweight and obesity. Therefore, clinicians and nutritionists cannot ignore these characteristics if they wish effectively to modify the customary diet, not only of their patients but of the general population.^{9,10}

Several studies establish a relationship between the Body Mass Index (BMI) and diverse epidemiological factors that mark the life styles of the population; thus a direct relationship is found between BMI and sedentary work and consumption of alcohol; BMI has also been related, but inversely, to physical exercise, educational level and consumption of tobacco.¹¹ Physical exercise is particularly important as one of the habits with most influence in the control of obesity: a level of practice of 300 minutes/week (60 minutes per day for 5 days) is recommended in general for the population.¹²⁻¹⁴

Faced with the higher figures of prevalence of obesity and the increase experienced in recent years in the regions of the south of Spain, we proposed to conduct a study that would confirm the levels of prevalence, and evaluate the role played by eating habits and life styles. Knowledge of these factors will enable us to intervene adequately in the prevention of obesity with the aim of controlling the current trend towards an increase.

The objectives that were set for the present study are:

- To assess the prevalence of overweight and obesity in the population aged 15 or more years in the city of Cadiz.

- To determine the relationship between life styles factors and excess weight, specially physical activity, leisure-time activities, consumption of alcohol and tobacco.

Material, subjects and methods

An cross-sectional study based on a population was carried out. The reference population comprises the set of persons resident in Cadiz, aged 15 years or more (116,743 subjects according to the municipal register for the year 2002).

The minimum sample size has been estimated at 2,569 subjects (for an obesity prevalence of 13.4 % and a error of 10%); the total number of individuals included in our study was 2,640. A random sampling by clusters was conducted, and in our case this involved sampling and study all municipal districts. Each districts has been considered an area or cluster. The number of subjects selected was proportional to the population size of the area; the selection of subjects was random and stratified by sex and age group.

Data collection was preceded by an information campaign in the local press, radio and television, with the support of the municipal authority. After that data was collected by a home-based survey; the survey personnel used for this were appropriately trained in respect of selection criteria, approach to the interviewees, access to subjects' homes, presentation, measurement, and other important aspects. Only 2.7% of the subjects selected for the study refused to participate.

We had collected information about sociodemographic data (age, sex, level of education, occupation/employment, and income); family and personal antecedents relating to overweight, obesity and pathologies related to these processes (diabetes and metabolic disorders); Life styles (tobacco and alcohol consumption, physical activity, and leisure time activities); and eating habits, studied using a retrospective qualitative record of eating during a 24 hour period.

Anthropometric measures: weight, height, waist and hip circumference were measured using standard techniques by trained staff. Overweight and obesity were defined as a BMI of 25-29.9 and ≥ 30 kg/m², respectively. Waist-hip ratio (WHR) was calculated as a good indicator of central obesity; WHR values of > 1 in men and > 0.85 in women have been proposed as delimiters of the risk of obesity.

SPSS 11.0.1 programs were utilised for the inputting, tabulation and statistical analysis. For the statistical analysis have been calculated the prevalence ratios (PR), Chi Squared, Pearson's and Spearman's Rho coefficient of correlation. Logistic regression has been used to study the association between the different variables that reflect the life styles and the presence of BMI > 25 ; the results are presented as odds ratio (OR, exp β).

Table I
Prevalence of overweight and obesity by sex according Body Mass Index (BMI)

BMI classification	Prevalence (%)			Prevalence Ratio M/W	CI 95% Prevalence ratio	P value
	Total	Men	Women			
Underweight (BMI: < 18,5)	1.5	0.6	2.2	0.29	0,13-0,62	P < 0,002
Normalweight (BMI: 18,5-24,9)	45.1	36.8	52.5	0.70	0,64-0,77	p < 0,00001
Overweight (BMI: 25,0-29,9)	36.3	44.7	28.8	1.56	1,40-1,72	p < 0,00001
Obesity (BMI: ≥ 30,0)	17.1	17.9	16.5	1.08	0,92-1,28	N.S.
Class I (BMI: 30,0-34,9)	13.8	15.3	12.4	1.23	1,02-1,49	p < 0,04
Class II (BMI: 35,0-39,9)	2.8	2.3	3.4	0.66	0,42-1,05	N.S.
Morbid obesity (BMI: ≥ 40,0)	0.5	0.3	0.7	0.49	0,15-1,60	N.S.
Overweight + obesity (BMI: ≥ 25,0)	53.4	62.6	45.3	1.38	1,29-1,49	p < 0,00001

Results

The study analyses data of 2640 subjects, with a age range of 15-82 years (mean 43.3 years); 52.7% of subjects are women. The mean BMI was 25.89 (25.71-26.05), with significant differences between the sexes (26.50 in men and 25.3 in women). The waist-hip ratio (WHR) mean was 0.87, with a mean value of 0.92 in men and 0.84 in women.

The prevalence of overweight in Cadiz reaches 36.3%, and prevalence of obesity is 17%; the distribution by obesity is 13.8% for class I (BMI 30 to 34.9), 2.8% for class II (BMI 35 to 39.9), and 0.5% for morbid obesity (BMI ≥ 40) (table I). Adjusted for spanish population (2001 census) overweight prevalence is 37.6% (CI 95% 35.7-39.4) and the obesity prevalence reaches a 17.4% (CI 95% 15.9-18.8).

Significant differences between men and women are observed: overweight is predominant in men in all the age groups; obesity is higher in men in the 15 to 34 year old age-group; between 35 and 64 years, obesity prevalence is similar in both sex; and above 65 years it is again higher in men but the difference (2%) is not significant. The prevalence of overweight plus obesity (BMI ≥ 25) is greater in men than in women, except for

those aged 45-54 years, in which the women are predominant (fig. 1).

In contrast, low weight is much more prevalent in women and presents the highest percentage in the youngest age group, falling from 15.1% in the subjects aged 15-24 years (5.8% in men and 24% in women), to 1.6% in women aged 45-54 years, but showing a slight increase in age groups older than this.

Table II presents the characteristics of the population studied in respect of overweight and obesity according to the various behavioural and life styles parameters. On relating BMI with the life styles of the subjects, we have not found significant differences in the prevalence of overweight and obesity by tobacco use, although a higher consumption of cigarettes in obese (18.7 cigarettes/day) than in non-obese smokers. Male smokers present a greater prevalence of overweight and obesity, whereas in female smokers is significantly lower.

The prevalence of overweight and obesity is greater in those subjects who drink alcohol daily (69.8%), compared with those who do not drink or who do so only at weekends (PR = 1.39, 1.29-1.50), with this difference being especially evident in those aged 34 or less. This finding is particularly significant in men,

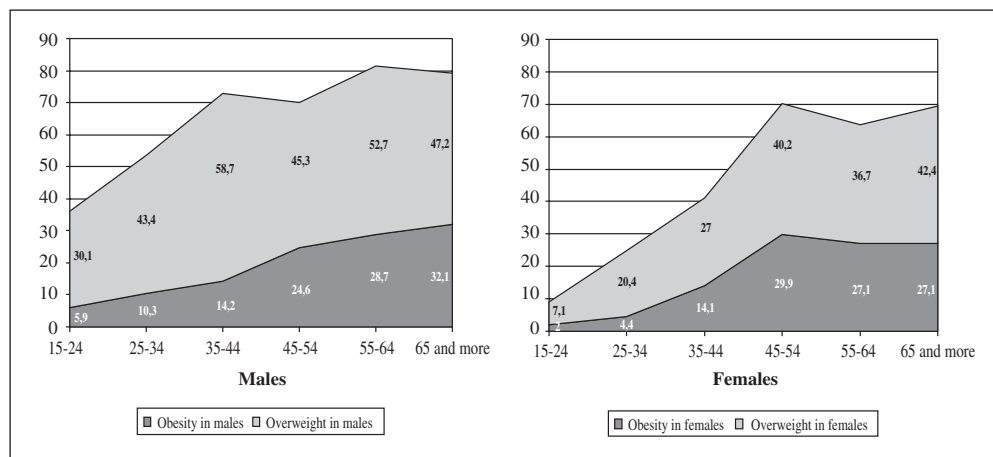


Fig. 1.—Distribution of overweight and obesity by sex and age group.

Table II
Habits of the subjects studied and prevalence of overweight and obesity (BMI ≥ 25)

	BMI ≥ 25 prevalence (%)	PR*	Prevalence ratio		p-value
				95% CI†	
Physical exercise (Yes/No)	47.40 vs 59.80	0.82		0.76-0.88	0.0000
Men	53.9 vs 70.1	0.77		0.70-0.84	0.0000
Women	40.0 vs 48.3	0.82		0.76-0.94	0.0028
Active leisuretime pursuits (Yes/No)	51.43 vs 57.02	0.90		0.84-0.97	0.005
Men	59.3 vs 69.0	0.86		0.79-0.93	0.001
Women	43.6 vs 47.7	0.91		0.81-1.02	NS
TV Every day (Yes/No)	54.07 vs 47.30	1.14		1.01-1.31	0.03
Men	63.0 vs 58.8	1.07		0.92-1.23	0.33
Women	46.3 vs 31.0	1.49		1.10-2.01	0.003
Smoker (Yes/No)	52.46 vs 54.0	0.97		0.90-1.05	NS
Men	67.0 vs 59.4	1.12		1.03-1.22	0.006
Women	34.6 vs 49.8	0.69		0.60-0.80	0.0000
Daily consumption of alcohol	69.88 vs 50.27	1.39		1.29-1.50	0.0000
Men	77.4 vs 57.6	1.34		1.23-1.45	0.0000
Women	49.1 vs 44.9	1.09		0.89-1.33	0.386
Slimming Diet (Yes/No)	79.03 vs 50.70	3.29		2.45-4.42	0.0000
Men	87.7 vs 60.6	1.44		1.32-1.58	0.0000
Women	74.0 vs 41.4	1.78		1.59-2.00	0.0000
CONSUMPTION OF FOODS (Yes/No)					
Dairy products	54.18 vs 50.0	1.08		0.98-1.20	NS
Men	63.3 vs 58.5	1.08		0.96-1.21	0.18
Women	46.0 vs 42.1	1.09		0.93-1.27	0.26
Meat	53.63 vs 50.97	1.05		0.92-1.21	NS
Men	61.9 vs 70.4	0.88		0.75-1.03	0.15
Women	45.8 vs 40.7	1.12		0.90-1.39	0.25
Potatoes	52.36 vs 52.36	1.03		0.96-1.11	NS
Men	61.8 vs 63.7	0.97		0.88-1.06	0.52
Women	46.1 vs 44.0	1.04		0.92-1.17	0.45
Green vegetables	53.94 vs 52.37	1.03		0.95-1.11	NS
Men	64.4 vs 58.9	1.09		0.99-1.20	0.05
Women	45.1 vs 45.6	0.96		0.87-1.11	0.85
Fruit	54.52 vs 51.88	1.05		0.98-1.13	NS
Men	66.4 vs 57.6	1.15		1.05-1.26	0.0014
Women	44.9 vs 45.8	0.98		0.87-1.10	0.75
Bread	54.38 vs 47.31	1.15		1.02-1.29	P < 0.05
Men	63.0 vs 58.3	1.08		0.94-1.24	0.24
Women	46.5 vs 38.0	1.22		1.01-1.48	0.028
Fats	54.48 vs 50.56	1.08		0.99-1.17	NS
Men	62.2 vs 63.0	0.98		0.89-1.08	0.78
Women	47.5 vs 39.2	1.21		1.05-1.39	0.0058

*PR: Prevalence ratio; †95%C.I. : 95% Confidence Interval

where the prevalence of overweight and obesity is 20% higher in those who consume alcohol every day.

The mean alcohol consumption in subjects with BMI ≥ 25 is 95.4 g/week (IC 95% 86.8-103.9) in men and 19.8 g/week (IC 95% 15.9-23.7) in women. In general, the consumption of alcohol is higher in those subjects with overweight than in those with obesity, and this difference

is more marked in the younger age groups. In men, the highest consumption of alcohol is observed in subjects with overweight aged up to 34 years; but in older age groups the regular consumption of alcohol is significantly high among obese subjects. In women the highest levels of alcohol consumption are found in the group of women with overweight aged up to 64 years.

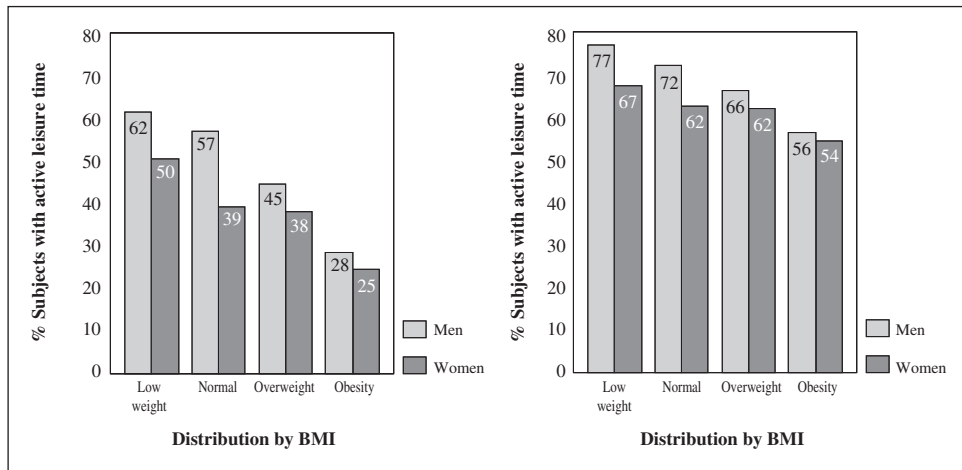


Fig. 2.—Physical exercise and active leisure time pursuits attending distribution of BMI.

Physical exercise is practiced to some extent by 41.6% of the population of Cadiz; individual physical exercise is more predominant than collective, and its practice is more frequent in men than in women (PR = 1.24, 1.13-1.35). The mean of age of those who practice exercise is 39.7 years, while a 46 years for those who do not. The approximate mean length of time during which exercise is taken is 6.2 hours/week in men, against 5.5 hours/week in women. An association exists between the practice of physical exercise and the presence of obesity: the prevalence of BMI ≥ 25 is lower in those subjects who undertake physical exercise than in those who do not (PR = 0.82, 0.76-0.88). Considering only the subjects with obesity, it is observed that its prevalence in those who practice exercise is 10.9%, whereas in those who do not, the prevalence of obesity is 21.6% (PR = 1.98, 1.63-2.41). A inverse relationship is found between the daily practice of physical exercise, and BMI in both men and women (fig. 2); the percentage of subjects who practice physical exercise daily decreases inline with increasing BMI.

Overall, active leisure time pursuits are associated with significantly lower prevalences of overweight in males; whereas passive activities like watching TV are associated with higher prevalences of overweight and obesity only in women. When we look at the active leisure time pursuits of subjects (walking, sport, gardening, etc) compared with sedentary activities (reading, listening to music, watching television, etc), we find a statistically significant higher proportion of subjects with active pursuits in those of normal weight, compared with the obese (PR = 1.15, 1.07-1.24) (fig. 2).

Regarding the amount of television watched, a greater prevalence of BMI ≥ 25 is observed in those who watch every day, than in those who do not (PR = 1.4, 1.00-1.31). The mean consumption of TV per week is 15.1 hours in the subjects with normal weight, against 21 hours in the obese subjects ($p < 0.0001$).

Slimming diets are followed more frequently by women (11.5%) than by men (7.3%) (PR = 1.58 1.23-

2.02), and differences have been found in the consumption of foods in respect of sex and age group; the consumption of meats, fish and eggs (PR = 1.04, 1.02-1.07), potatoes, vegetables and nuts (PR = 1.12, 1.06-1.19) is higher in men than in women, whereas the consumption of green vegetables and salads (PR = 0.94, 0.89-0.99) and fruits (PR = 0.89, 0.83-0.95) is higher in women. No significant differences have been found in the consumption of bread, pastas and cereals, nor of oils and fats, between men and women.

An association has been found between BMI and the tendency to eat between meals, whether mid-morning, mid-afternoon, or on going to bed, and eating at tea-time (early evening).

When we look at eating habits, we find that subjects with overweight and obesity follow a slimming diet in higher proportions (11.5% and 19.6%, respectively) than subjects with low and normal weight (3.4% and 4.4%, respectively) (PR = 3.29, 2.45-4.42). Overall, we do not find differences in the prevalence of weight overload in function of the pattern of foods consumed, except for the bread and cereals group. In women, higher prevalence of overweight and obesity is associated with a higher consumption of bread, cereals and fatty foods.

Multilogistic regression analysis revealed an association between age and excess weight (overweight and obesity), which is observed in men and women. In this model we analyse the combined influence of the variables related to life styles on the presence of excess weight (table III), we find a higher risk of BMI $> 25\%$ in men (OR = 4.48) who are older, in married (OR = 1,72) or divorced (OR = 1.76) persons, in housewives (OR = 1.98) and in persons with higher consumption of foods of the bread and cereals group (OR = 1.44); acting in the opposite direction associated with excess weight the physical activity (OR = 0.80) and the alcohol consumption (OR = 0.63).

Table III
Variables related to lifestyle characteristics associated with excess weight (BMI > 25)

Variable	Category	Sig.	OR (exp. B)	OR 95% CI		Men			Women		
						OR (exp.B)	OR 95% CI	OR (exp.B)	OR 95% CI		
Sex	Women	0.000	1								
	Men		4.48	3.57	5.64						
Age (years)		0.000	1.02	1.01	1.03	1.01	1.00	1.03	1.02	1.01	1.04
Marital status	Single	0.001	1			1			1		
	Married	0.000	1.72	1.35	2.25	1.62	1.10	2.38	2.34	1.57	3.50
	Divorced	0.034	1.66	1.04	2.67	3.03	1.17	7.84	1.72	0.94	3.14
	Widowed	0.180	1.37	0.86	2.19	1.30	0.61	2.75	1.59	0.86	2.92
Work-related status	Active	0.000	1			1			1		
	Temporal unemployed	0.077	1.36	0.96	1.93	1.58	0.95	2.62	1.27	0.76	2.12
	Passive class	0.755	1.06	0.71	1.57	1.06	0.63	1.80	1.73	0.90	3.30
	Student	0.001	0.57	0.40	0.79	0.46	0.30	0.71	0.75	0.41	1.34
	Housework	0.000	1.98	1.47	2.66	1.27	0.20	7.88	1.90	1.34	2.68
Alcohol	No	0.000	1			-			1		
	Occasionally	0.010	0.73	0.57	0.92				0.64	0.47	0.87
	Weekends	0.000	0.55	0.42	0.72				0.45	0.29	0.69
	Daily consumption	0.032	0.72	0.53	0.97				0.53	0.33	0.84
TV every day	No	0.049	1			-			-		
	Yes		1.37	1.00	1.89						
Slimming diets	No	0.000	1			1			1		
	Yes		4.60	3.18	6.65	4.00	2.03	7.87	5.01	3.19	7.85
Consumption of bread and cereals	No	0.007	1			-			1		
	Yes		1.44	1.10	1.89				1.70	1.15	2.50
Physical activity	No	0.022	1			-			-		
	Yes		0.80	0.66	0.96						
Sport practice	No	0.773	-			1			-		
	Yes					0.71	0.54	0.93			

Multiple logistic regression analysis - Non explanatory variables: Active and sedentary leisure time pursuit and Smoking habit. OR: odds ratio; CI confidence interval.

Discussion

Obesity is a serious problem in our area, and its prevalence is higher than the average for Spain (17% against 14.5%),^{6,15} but lower than the figures of around 21.5% reported by other authors for Andalusia,⁷ despite this study having been conducted in a densely-populated urban area where the mean age is relatively high.

The prevalence of obesity increases in line with increasing the age, and reaches its highest levels in the 55-60 year old age group,¹⁶ however prevalence is now growing significantly in ever-younger age groups.⁸ There is no geographical uniformity on the distribution of overweight and obesity in the population according to sex; in our study we have found that the prevalence of both obesity and overweight in general is greater in men, a finding that is reported for several other regions of Spain and other European countries, principally those of the Mediterranean;⁶ this differs from the fin-

dings in other countries, such as the USA and some Latin American ones, where the prevalence of overweight is continues to be higher in men but obesity affects more women.⁵

In respect of aspects of life style, there is no clear consensus when the relationship between consumption of tobacco and obesity is studied;^{1,2} in our study area, we do not observe an association between BMI and the subject being a smoker or non-smoker, although it has been found that consumption of cigarettes is higher in obese smokers compared with other categories of smoker. Unanimity does exist among authors on the relationship between the consumption of alcohol and obesity.^{11,18,19} Some authors establish a relationship between alcohol consumption, poor eating habits BMI and the distribution of body fat independently of the genetic component,²⁰ specially in certain alcoholic drinks like classic beer.²¹ The values found in our study regarding the consumption of alcohol are very high,

especially in males, in whom the prevalence of overweight and obesity reaches higher values than in women; this would possibly explain the clear relationship found between the daily consumption of alcohol and the presence of weight overload in our study area.

There appears to be no doubt about the inverse relationship existing between physical activity and obesity,^{3,4,7,17} and the benefit and its preventive effect by acting on the control of fats and cholesterol.^{13,14} In our study, the prevalence of obesity found in subjects with no physical exercise is double that found in those who do; another finding, mainly in men, is that average time devoted to physical exercise in Cadiz is somewhat higher than the level recommended by some authors (6.2 hours/week against 5 hours/week),¹² this may explain that in our area sport practice is protective of excess weight only in men. This relationship between physical activity and obesity becomes even clearer on interrelating the prevalence of sedentary behaviour,^{22,23} in contrast to other more active leisure time pursuits. A clear increase is observed in the prevalence of obesity in subjects who spend more hours a day watching television, and this prevalence is higher than that reported by other authors.²³ It is notable that the performance of active leisure time pursuits is not associated with less overweight in our study area, in contrast to the practice of physical activity or sport, which does give protection; this difference could be explained by the low intensity and short duration of leisure activities compared with the specific practice of physical exercise.

A similar conclusion can be drawn in respect of sedentary forms of leisure time activity, particularly watching TV or by analogy, playing video games, Internet, etc. When analysed jointly, there does not seem to be an association with the presence of BMI higher than 25, but, taken in isolation, the large number of hours of television viewing is a factor associated with higher BMI values; the explanation for this could be that the long daily duration of such habits, unlike most other activities, is closely associated with other habits of high risk like the high regular consumption of alcohol and eating high calorie foods, particularly between meals.

The combination of changes in eating and increases in sedentary behaviour of various kinds have contributed significantly to the increased prevalence of overweight and obesity in our society.² The increased consumption of foods with higher calorie content, such as those found in many "fast foods" and "convenience meals" and in foods consumed between meals, is known to provoke changes in the control of appetite in the human organism.^{3,18}

In our study area, we find a higher calorific food consumption (more meat, fish, eggs, potatoes, vegetables, nuts) in men, in whom the prevalence of overweight and obesity is greater, together with the habit of eating between meals (mostly cakes, biscuits, snacks and sweets), whereas the consumption of fibres, fruits and vegetables is greater in women. It does appear, there-

fore, that there is a difference in eating patterns between men and women, and this difference, taken together with a higher alcohol consumption in men and less tendency to follow a slimming diet, may be contributing to the increasing prevalence of overweight and obesity in men.^{22,24}

The following of slimming diets in the study area demonstrates that the population is aware of the influence of diet in the control of weight overload, with the result that there is a close association between following a diet and the presence of a very high BMI value. However, this attitude is not seen to be complemented by other beneficial conduct such as decreased consumption of alcohol and television, or increased physical activity. This suggests that these latter forms of beneficial conduct must be promoted more strongly in therapeutic and health education programs for the general population.

References

1. Mercer SL, Green LW, Rosenthal AC, Husten CG, Khan LK, Dietz WH. Possible lessons from the tobacco experience for obesity control. *Am J Clin Nutr* 2003; 77: 1073-1082.
2. Aranceta J. Community nutrition. *Eur J Clin Nutr* 2003; 57: 79-81.
3. Prentice AM, Jebb SA. Fast foods, energy density and obesity: a possible mechanistic link. *Obes Rev* 2001; 2: 141-7.
4. Koh-Banerjee P, Chu NF, Spiegelman D, Rosner B, Colditz G, Willett W, Imm E. Prospective study of the association of changes in dietary intake, physical activity, alcohol consumption, and smoking with 9-y gain in waist circumference among 16587 US men. *Am J Clin Nutr* 2003; 78: 719-27.
5. Banegas JR, López-García E, Gutiérrez-Fisac JL, Guallar-Castillón P, Rodríguez-Artalejo F. A simple estimate of mortality attributable to excess weight in the European Union. *Eur J Clin Nutr* 2003; 57: 201-8.
6. Aranceta Bartrina J. Prevalencia de obesidad en los países desarrollados: situación actual y perspectivas. *Nutr Hosp* 2002; 17: 34-41.
7. Gutiérrez-Fisac JL, Banegas Banegas JR, Artalejo FR, Regidor E. Increasing prevalence of over weight and obesity among Spanish adults, 1987-1997. *Int J Obes Relat Metab Disord* 2000; 24: 1677-82.
8. Entrala-Bueno A, Iglesias C, De Jesús F. Diet and physical activity. A healthful binomial. *Eur J Clin Nutr* 2003; 57: 63-5.
9. Szapary PO, Bloedon LT, Foster GD. Physical activity and its effects on lipids. *Curr Cardiol Rep* 2003; 5: 488-92.
10. Bellisle F. Why should we study human food intake behaviour? *Nutr Metab Cardiovasc Dis* 2003; 13: 189-93.
11. Ishizaki M, Morikawa Y, Nakagawa H, Honda R, Kawakami N, Haratani T, Kobayasi F, Araki S, Yamada Y. The influence of work characteristics on body mass index and waist to hip ratio in Japanese employees. *Ind Health* 2004; 42: 41-9.
12. Jakicic JM. Exercise in the treatment of obesity. *Endocrinol Metab Clin North Am* 2003; 32: 967-80.
13. Katzmarzyk PT, Janssen I, Ardern CI. Physical inactivity, excess adiposity and premature mortality. *Obes Rev* 2003; 4: 257-90.
14. Akbartartoori M, Lean ME, Hankey CR. The associations between current recommendation for physical activity and cardiovascular risks associated with obesity. *Eur J Clin Nutr* 2008; 62:1-9.
15. Gutiérrez-Fisac JL, Rodríguez Artalejo F, Guallar Castillon P, Banegas Banegas JR, del Rey Calero J. Determinants of geographical variations in body mass index (BMI) and obesity in Spain. *Int J Obes Relat Metab Disord* 1999; 23: 342-7.

16. Martínez Ross MT, Tormo MJ, Navarro C, Chirlaque MD, Pérez Flores D. Extremely high prevalence of overweight and obesity in Murcia, a Mediterranean region in south-east Spain. *Int J Obes Relat Metab Disord* 2001; 25: 372-80.
17. Rodríguez Artalejo F, López García E, Gutiérrez Fisac JL, Bane-gas Banegas JR, Lafuente Urduinguio PJ, Domínguez Rojas V. Changes in the prevalence of overweight and obesity and the risk factors in Spain, 1987-1997. *Prev Med* 2002; 34: 72-81.
18. Lyu LC, Hsu CY, Yeh CY, Lee MS, Huang SH, Chen CL. A case-control study of the association of diet and obesity with gout in Taiwan. *Am J Clin Nutr* 2003; 78: 690-701.
19. Thiele TE, Navarro M, Sparta DR, Fee JR, Knapp DJ, Cubero I. Alcoholism and obesity: overlapping neuropeptide pathways. *Neuropeptides* 2003; 37: 321-37.
20. Greenfield JR, Samaras K, Jenkins AB, Kelly PJ, Spector TD, Campbell LV. Moderate alcohol consumption, dietary fat com-position and abdominal obesity in women:evidence for gene-environment interaction. *J Endocrinol Metab* 2003; 88: 381-6.
21. Bobak M, Skodova Z, Marmot M. Beer and obesity: a cross-sectional study. *Eur J Clin Nutr* 2003; 57: 1250-3.
22. Tur JA, Serra-Majem L, Romaguera D, Pons A. Profile of over-weight and obese people in a Mediterranean Region. *Obesity Research* 2005; 13: 527-536.
23. Vioque J, Torres A, Quiles J. Time spend watching television, sleep duration and obesity in adults living in Valencia, Spain. *Int J Obes Relat Metab Disord* 2000; 24: 1683-8.
24. Rodríguez-Rodríguez E, Perea JM, Bermejo LM, Marín-Arias L, López-Sobaler AM y Ortega RM. Hábitos alimentarios y su relación con los conocimientos, respecto al concepto de dieta equilibrada, de un colectivo de mujeres jóvenes con sobrepeso/obesidad. *Nutr Hosp* 2007; 22: 654-60.