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Research report

Overweight and obesity: The role of education, employment and income in Spanish adults

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ABSTRACT

Objective: To study the relationship between obesity prevalence and education, employment and socioeconomic levels to improve the designing of intervention programs.
Methods: Cross-sectional population-based study on 2640 subjects over 15 years of age in Spain. Through interviews conducted in subjects' homes we have obtained socio-demographic, anthropometric data, and information on physical activity, life styles and eating habits. Statistically, we have used prevalence ratios with confidence intervals and logistic regressions.
Results: The prevalence of overweight and obesity is 36.4% (IC95% 34.5–38.2) and 17% (IC95% 15.7–18.5), respectively, higher in men, and increasing with age. Obesity prevalence is independent of education level. Higher prevalence of overweight and obesity are found in the lowest occupational categories, and there is an inverse relationship between BMI and employment situations. Obesity is more prevalent in retired people and people that work from home, compared with professions that require activity at work. The association found between obesity and socioeconomic characteristics of the population is different in men and women: in women only, this risk was found to be associated with low or primary education levels (OR 2.4, 1.5–4.0), being unemployed or working at home (OR 1.6, 1.08–2.4) and having a medium income (OR 1.87, 1.03–3.33).
Conclusions: We have confirmed a high prevalence of overweight and obesity in our area. Socioeconomic variables have a more predictive value in women than in men.

1. Introduction

The combination of changes in eating habits and sedentary life styles has contributed significantly to the increased prevalence of overweight and obesity in our society (Aranceta, 2003). The increased consumption of foods with higher energy content, like those found in convenience meals, cause changes in the human organism's appetite control and contribute to conditions of overweight and obesity (Prentice & Jebb, 2001).

A wide variability in the prevalence of obesity is found between different countries. A higher prevalence is observed in the Mediterranean countries and those of Eastern Europe, in comparison with the countries of Northern, Western and Central Europe (Aranceta, 2003). Spain presents lower values of prevalence of obesity in relation to the USA or Latin American countries (Jacoby, Goldstein, López, Nuñez, & López, 2003; Jeffery & Utter, 2003).

The prevalence of obesity currently estimated for the Spanish population as a whole is 14.5%, and that of overall overweight or obesity is 53.5% (Rodríguez-Artalejo et al., 2002). Considering the total population aged from 25 to 64 years, the prevalence of overweight and obesity in Spain increased by 2.2% in recent years (Gutierrez-Fisac, Banegas Banegas, Artalejo, & Regidor, 2000). Geographic differences have been observed in the prevalence of obesity between various Spanish regions, with prevalence being higher in the southern and eastern regions of the country, including Andalusia. For some authors, it would be necessary to consider socioeconomic differences among the causes of these geographic differences (Gutierrez-Fisac, Rodríguez Artalejo, Gual-lar Castillon, Banegas Banegas, & del Rey Calero, 1999).

Several authors argue that there is an association between obesity and diverse variables such as age, sex, education level, occupation, life styles, etc. (Belliste, 2003; Martínez Ross, Tormo, Navarro, Chirlaque, & Pérez Flores, 2001). In various studies an inverse relationship has been found between education level and the prevalence of obesity, in both males and females as groups. A difference in the educational level has been established in relation

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to knowledge about nutrition (Hall, Reeder, Muhajarine, & Lasiuk, 2003; Ishizaki et al., 2004).

A relationship has also been found between social class, occupational activity and a higher prevalence of obesity, all depending on the life styles of the subject (Langenberg, Hardy, Kuh, Brunner, & Wadsworth, 2003).

Similarly, socioeconomic factors influence the development and maintenance of obesity (Drewnowski & Spectes, 2004). A greater prevalence of obesity is observed in developed compared with developing countries; in richer countries people generally have diets that are richer in high-energy foods, with a proportionately lower consumption of fiber, fruits and vegetables.

Andalucia, located in the south of Spain, is one of the regions where the highest prevalences of overweight and obesity are observed in the entire country (Aranceta-Bartrina, Serra-Majem, Fox-Sala, Moreno-Esteban & Grupo colaborativo SEEDO, 2005). At the same time, within this same region, the city of Cadiz is the city that presents the highest number of obese people, and it is characterized by important socioeconomic transformations in the last few years, from a population almost entirely employed in naval construction, fishing and port activities, to high levels of unemployment and a high percentage of workers in the service sector. However, even with this transformation, the percentage of women participating in the work force in small, maintaining habits of cooking meals at home, with only 10–20% of children eating in school cafeterias and, aside from nutritional control of pregnant women and of infants in their first year of life that is offered to the entire population, community nutrition programs do not exist.

In recent years there has also been a significant increase in the presence of fast food establishments and inexpensive food at super markets, possibly coinciding with certain life style changes, such as the increase in alcohol consumption, sedentary habits, etc. In a population of approximately 128,000 habitants, there are 137 establishments dedicated solely to serving food and drink to private contingents (excluding school and work cafeterias).

The aim of this present study is to verify the prevalence of overweight and obesity in the Andalusian population as higher than the general Spanish population and to examine the possible relationship with variables such as education level, employment and socioeconomic level.

2. Methods

2.1. Survey details

An observational, descriptive and cross-sectional population-based study has been carried out. The reference population consists of a group of people over 15 years old that are residents of the city of Cadiz; from the municipal register, this group consists of 116,743 subjects.

The minimum sample size, allowing for a relative error of 10% has been estimated at 2569 subjects; the total number of individuals included in our study was 2640. Random sampling by clusters was conducted, and in our case, this involved sampling by municipal districts. The response rate was 97.3%.

The 10 districts that form the city of Cadiz have been studied. Each of these has been considered as an area or cluster, except in the case of the three largest districts, which were each divided into three areas. As a result, the total number of sample units at this level (areas or clusters) is 16. In each area/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. This way, we obtain a representative sample of the population for variables such as employment situation, occupation and income level.

2.2. Questionnaires

Data was collected by a home-based survey (structured interviews conducted in the place of residence); the survey personnel used in data collection were appropriately trained in the following areas: access to subjects' homes, presentation, selection criteria, approach to the interviewees, measurement, completion of the questionnaires, and other important aspects.

The following information was collected:

- General or personal data.
- Anthropometric data: weight, height, waist and hip circumference, waist and hip ratio, and body mass index. Height and weight measurements were obtained using standardized techniques and equipment. Body mass index (BMI) was calculated as weight in kg/height in m^2. For adults, overweight and obesity were defined as a BMI of 25.0–29.9, and 30.0 or more, respectively. Also we have distinguished three degrees of obesity: from 30.0 to 34.9 (Grade I), from 35.0 to 39.9 (Grade II) and 40.0 and over (Grade III). Waist–hip ratio (WHR), is accepted as a good indicator of central obesity; WHR values of >1 in men and >0.85 in women have been proposed as limits for the risk of obesity (Gutierrez-Fisac et al., 1999; Rodríguez-Artalejo et al., 2002).
- Eating habits: studied using a qualitative record of eating during a 24 h period.
- Socio-demographic data (including education level, occupation, employment situation, and income level).

The employment situation has been classified in the following five categories: active, unemployed, retired, student, and at-home worker.

To study the occupation as an indicator of social class, the classification proposed by the Spanish Society of Epidemiology (Alvarez-Dardet, Alonso, Domingo, & Regidor, 1995) was used; this classification follows the model of social class proposed by Goldthorpe and Llewellyn (1987). The occupation classification contains the following categories:

(I) Professionals: Managers employed in public administration and by companies with more than 10 full employees. Professionals in fields requiring a university degree of 2nd and 3rd cycle level.
(II) Intermediate occupations: Managers employed by companies with less than 10 full employees, professionals in fields requiring a university qualification of 1st cycle level, technicians and supporting professionals, artists and sportsmen/women.
(III) Administrative employees: Supporting professionals in administrative and financial fields, workers in personal and security services, self-employed workers, and supervisors of manual workers.
(IV) Qualified and semi-qualified manual workers.
(V) Unqualified workers.

The income levels are obtained by taking the total monthly income of the family unit. Six categories have been classified, from income lower than €300 to familiar income higher than €2700 monthly.

2.3. Statistical analyses

The prevalence of overweight and obesity was obtained by fitting rates using a direct method, taking the distribution by age groups of the Spanish population in the 2001 Spanish census.

The inputting and tabulation of the data was done with the Epi Info 6.04a program, while SPSS 11.0.1 programs were used for statistical analysis. Analyses were performed separately for each sex. In statistical analysis, in addition to measurements of central trend and dispersion, prevalence ratios and their confidence intervals were calculated, and parametric and non-parametric tests were used.

Cross-tabulation identified the proportion of respondents from different socio-demographic groups and the proportion of subjects with overweight or obesity. Significant differences were tested using Pearson chi-square analysis. Differences in the mean BMI across occupations, employment situations or income levels were evaluated using one-way analysis of variance (ANOVA) or the Kruskal–Wallis test. When statistically significant effects were encountered ($p < 0.05$), comparisons of means were done using the Scheffe/Tukey post hoc multiple comparison test.

The association between the different variables and the presence of weight overload in the population was studied using logistic regressions. The results are presented as OR (Exp(B)) with their confidence intervals to 95%; the measurement of the contribution of each of the variables studied and the BMI were obtained using categorical logistic regressions, taking the dependent variable (BMI) and breaking it down into the above-indicated levels.

3. Results

The total number of subjects studied was 2640, with a mean age of 43.3 (S.D. 18.7) years and an age range from 15 to 82 years. Men comprised 47.3% of the sample.

In respect to the anthropometric characteristics of the population, the mean weight obtained was 72.5 kg (IC95% 72.22–73.27) (79.6 kg in men and 66.5 kg in women); the mean height was 1.67 m (IC95% 1.67–1.67), 1.73 m. in men and 1.62 m in women; therefore the mean BMI was 25.89 (IC95% 25.71–26.05), with significant differences between sexes (26.50 in men and 25.3 in women). The overall mean WHR was 0.87, with a mean value of 0.92 in men and 0.84 in women.

The prevalence of overweight people found in Cadiz reached 36.3% (IC95% 34.5–38.2), and the prevalence of obesity was 17.1% (IC95% 15.7–18.5); the distribution of the obesity grade is as follows: grade I: 13.7%; grade II: 2.8%; grade III: 0.5%. The prevalence rate adjusted using the Spanish population of 2001 was 37.6% (IC95% 35.7–39.4) for overweight and 17.4 (IC95% 15.9–18.8) for obesity.

The prevalence of overweight and obesity taken together increases significantly with increased age (Table 1). Significant differences between men and women are observed in the prevalence of overweight and obesity: overweight is predominant in men in all age groups; obesity is higher in men in the 15–34-year-old age groups, between 35 and 64 years the obesity prevalence is similar in both sexes, and above 65 years it is again higher in men but the difference (2%) is not significant. Although both overweight and obesity are generally predominant in men, the more advanced degrees of obesity tend to be found in women.

Men and women present significantly different life styles. Alcohol consumption is greater in men, higher in overweight subjects than in obese subjects and this difference is greater in younger age groups. Overweight or obese men drink an average of 95.4 g/week of alcohol while women only drink 19.8 g/week. Physical exercise is more frequent in men; the mean age of those who exercise regularly is 39.7 years, compared with 46 years for those who do not. The approximate mean length of exercise time is 6.2 h/week, against 5.5 h/week in women. Obesity prevalence in subjects that exercise is 10.9% vs. 21.6% in those who do not (PR = 1.98, 1.63–2.41).

Table 1
Overweight and obesity by age and sex

	Body mass index (kg/m^2)							
	Below 20		20–24.9		25–29.9		30 or over	
	n	%	*n*	%	*n*	%	*n*	%
15–24 years								
Men	15	5.8	149	58.2	77	69.1	15	5.8
Women	62	24.5	168	66.4	18	7.1	5	1.9
25–34 years								
Men	5	1.7	125	44.5	122	43.5	29	10.3
Women	27	10.8	161	64.4	51	20.4	11	4.4
35–44 years								
Men	2	1.3	40	25.8	91	58.7	22	14.2
Women	15	2.7	94	50.8	50	27.0	26	14.0
45–54 years								
Men	–	–	61	31.6	92	47.6	50	25.9
Women	4	1.6	77	32.2	96	40.1	62	25.9
55–64 years								
Men	1	0.5	34	18.0	99	52.6	54	28.7
Women	5	2.6	63	33.5	69	36.7	51	27.1
65–74 years								
Men	1	0.9	19	18.2	51	49.0	33	31.7
Women	6	3.4	43	24.7	74	42.5	51	29.3
75 and more								
Men	2	3.6	11	20.0	24	43.6	18	32.7
Women	3	4.0	30	40.0	40	53.3	22	29.3
Total								
Men (1247)	26	2.1	439	35.2	556	44.6	221	17.7
Women (1392)	122	8.8	636	45.7	398	28.6	228	16.4

Regarding the amount of television watched, a greater prevalence of weight overload is observed in those who watch television every day, than in those who do not (PR = 1.4, 1.00–1.31). The mean time of TV watching per week is 15.1 h in the subjects with normal weight, whereas it is 21 h in obese subjects ($p < 0.0001$).

Table 2 presents the distribution of the population by sex, marital status, education, occupation and employment situation. The education level is low for 25% of the population (none or only primary education completed), whereas in 34%, tertiary levels have been completed. Comparing the education level between men and women, it is observed that it is generally lower in women than in men ($p < 0.0001$).

When the educational level is related to the condition of overweight and obesity in the population, we observe higher levels of obesity in subjects with lower education levels (Fig. 1); in contrast, the presence of underweight is greater at the higher education levels, that is, an inverse relationship is observed between the BMI and education levels in the population of Cadiz, although not reaching levels of statistical significance. When analyzing the

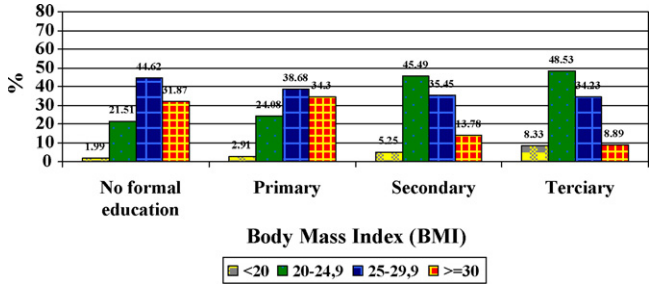

Fig. 1. BMI and level of education.

Table 2
General characteristics of the population studied

Variables	Categories	Men		Women		Total	
		n	%	*n*	%	*n*	%
Sex		1.248	47.3	1.392	52.7		
Marital status, *n* = 2.581	Single	488	40.1	441	32.3	929	36.0
	Separated/divorced	63	5.2	144	10.6	118	4.6
	Widow/widower	40	3.3	78	5.7	207	8.0
	Married/living with partner	626	51.4	701	51.4	1.327	48.0
Education *n* = 2.629	Illiterate or not formal education	61	4.9	190	13.7	251	9.5
	Primary	155	12.5	258	18.6	413	15.7
	Secondary	549	44.2	524	37.8	1073	40.8
	Tertiary	477	38.4	415	29.9	892	33.9
Occupation *n* = 1.457	V Unqualified workers	90	9.8	66	12.4	156	10.7
	IV Manual workers	326	35.3	159	29.8	485	33.3
	III Administrative and self-employed	209	22.6	89	16.7	298	20.5
	II Intermediate occupations	107	11.6	102	19.1	209	14.3
	I Professional	191	20.7	118	22.1	309	21.2
Employment situation, *n* = 2.607	Unemployed	98	7.9	108	7.9	206	7.9
	Retired	232	18.7	81	5.9	313	12.0
	Student	252	20.3	220	16.1	472	18.1
	Domestic/houseworker	5	.4	564	41.3	569	21.8
	Active	655	52.7	392	28.7	1047	40.2

relationship between the consumption of types of food and education level, an association is found between higher education levels and a higher proportion of people consuming fruit and vegetables, and an inverse relationship in respect to the consumption of fats.

In respect to the occupation variable as an indicator of social class, it is observed that there are no marked differences between men and women, although in women the percentages of higher professionals and manual workers without qualifications are higher.

Although we do not find significant differences in the percentage of subjects with a BMI over 25 between the different occupational levels (Fig. 2), we find an inverse relationship between the professional category and the prevalence of obesity. A higher prevalence of obesity is found in the category of the lowest level of occupation ($p < 0.0001$).

Considering the employment situation, it is observed that 40.2% of the population studied are actively employed, 7.9% are unemployed, 12.0% are retired, 18.1% are students, and 21.8% work from home; significant differences are found between men and women ($p < 0.0001$), with higher proportions of men actively employed and as students, and a higher proportion of women working from home. When establishing a relationship between overweight, obesity and employment situations, a significantly higher prevalence of obesity is observed in retired people (28.4%) and in people that work from home (26.7%), and a lower prevalence in students, unemployed people and actively employed subjects (3.4%, 12.7%, and 15.9%, respectively) (Fig. 2).

If we exclude the families with incomes lower than €300 per month, we find an inverse relationship between overweight and obesity and income levels (Fig. 3), with a higher prevalence of obesity found in subjects with low incomes, while in families with high incomes, underweight is more frequent. With respect to the families in a financially precarious situation, the prevalence of underweight people is higher, and the mean BMI found is lower than the mean of the population. An association has been found between levels of income and the percentage of subjects that consume certain foods like milk, vegetables, fruits and fats, such that with increasing levels of income, there is a higher proportion

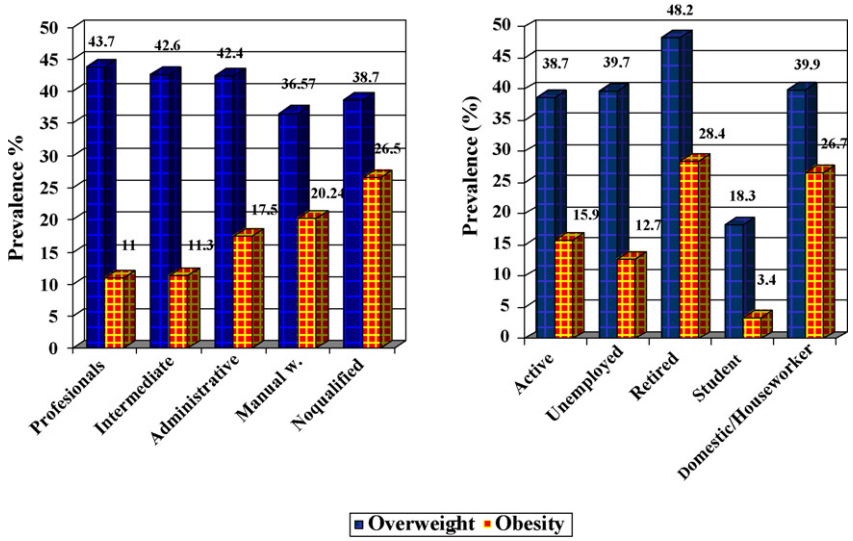

Fig. 2. Prevalence of overweight and obesity, by occupational category and employment situation. Categories proposed by the Spanish Epidemiology Society.

Table 3
Association between socioeconomic variables and overweight

	Men		95% CI Exp(B)		Women		95% CI Exp(B)		All		95% CI Exp(B)	
	Sig.	Exp(B)	Low	Upper	Sig.	Exp(B)	Low	Upper	Sig.	Exp(B)	Low	Upper
Sex (male)									.000	3.896	3.122	4.862
Age (years)	.049	1.015	1.000	1.031	.000	1.028	1.016	1.041	.000	1.021	1.012	1.031
Phys. exercise (1)	.133	.808	.612	1.067	.946	.990	.748	1.311	.527	.939	.773	1.141
Educational level												
Tertiary-university	.748				.003				.009			
No formal education	.324	1.477	.681	3.203	.011	2.118	1.191	3.766	.010	1.775	1.149	2.744
Primary	.473	1.200	.730	1.972	.000	2.450	1.497	4.008	.002	1.713	1.216	2.413
Secondary	.627	1.077	.798	1.454	.124	1.336	.924	1.932	.280	1.133	.903	1.422
Income level (€)												
Over 2700	.403				.000				.000			
None	.673	.855	.413	1.769	.015	.398	.189	.837	.008	.516	.316	.845
Less 300	.284	.474	.121	1.857	.636	.767	.256	2.298	.178	.570	.252	1.291
300–899	.418	1.230	.745	2.031	.106	1.679	.895	3.150	.103	1.371	.939	2.002
900–1499	.825	1.052	.673	1.642	.037	1.872	1.039	3.373	.087	1.353	.957	1.912
1500–2099	.318	1.298	.778	2.165	.057	1.873	.982	3.573	.036	1.518	1.027	2.246
2100–2699	.136	1.746	.839	3.635	.623	1.236	.531	2.875	.172	1.442	.852	2.442
Employment												
Active	.004				.079				.000			
Unemployed	.055	1.688	.988	2.885	.531	1.180	.703	1.982	.035	1.470	1.028	2.102
Retired	.899	.966	.565	1.651	.151	1.618	.839	3.120	.715	1.077	.722	1.607
Student	.012	.551	.346	.876	.182	.643	.336	1.229	.018	.649	.453	.928
Domestic/housework	.457	2.387	.241	23.679	.019	1.636	1.084	2.468	.000	2.024	1.449	2.826
Marital status												
Living with partner	.038				.000				.000			
Single	.009	.593	.401	.878	.000	.412	.273	.622	.000	.532	.405	.699
Separated/divorced	.311	1.553	.663	3.636	.102	.642	.377	1.092	.586	.888	.580	1.360
Widow/widower	.925	1.034	.514	2.081	.037	.585	.354	.967	.291	.807	.543	1.201
Constant	.674	1.193			.000	.120			.000	.195		

N = 2319 (321 cases lost). Variable "Occupation" not included in the model.

of subjects who consume these foods; a similar relationship is also confirmed when the education level is considered, although the consumption of fats is inversely proportional.

Using logistic regressions, we analyzed the joint relationship between education level, employment situation, income and marital status, with the presence of overweight and obesity (Table 3). In men, the higher risk of overweight and obesity shows scarcely any association with socioeconomic factors. We do not find an increased risk of overweight in function of either education or income levels. In contrast, we do find an association with the marital status and employment situation; the risk of overweight in unmarried males is 0.59 (0.4–0.8) and the risk of overweight in the unemployed compared with those in active employment is 1.6. As a group, students present the lowest risk of overweight (0.3–0.8), and this group is significantly associated with physical exercise.

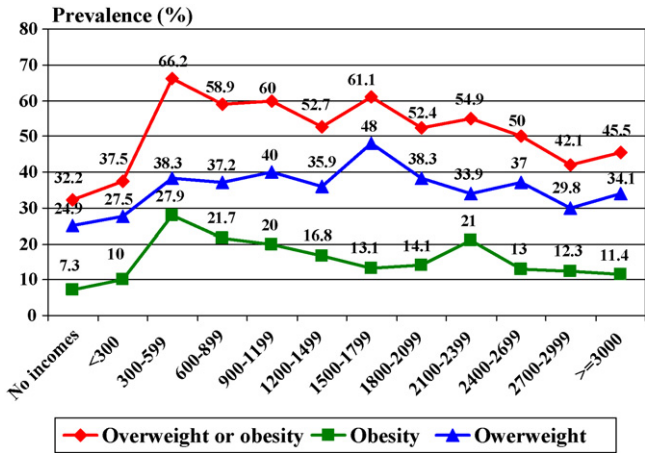

Fig. 3. Prevalence of overweight, obesity and weight overload, by income level. Household income per month, in euros.

In women, a higher risk of overweight and obesity is observed in those without any schooling or who only have primary education, in comparison with women with a university education (OR 2.1 and 2.4, respectively). The highest risk of overweight and obesity is also associated with low-income levels (€900–1500) and with employment at home (OR 1.6, CI95% 1.08–2.4). Compared with married women, those who are single or widowed, present lower risks of overweight and obesity.

As a whole, we do not find differences in the risk of overweight and obesity according to educational levels or occupation in our population, however, the prevalence of overweight and obesity was greater in subjects with lower education levels and in lower occupational statuses, a statistically significant difference was not found. When we analyze employment situations, we find that the categories of unemployed (OR = 1.45, 1.01–2.07) and at-home workers (OR = 2.01, 1.44–2.81) present significantly higher risks of overweight and obesity than students (OR = 0.64, 0.44–0.91) and employed people. In relation to the income of the family unit, we do not find an association between income level and the risk of overweight and obesity, except for in low-income groups (less than €300 per month) (OR = 0.52, 0.31–0.85).

Of all the variables considered, those that present a greater correlation with the categories studied in relation to the BMI are sex (male), marital status, employment situation and, lastly, level of income.

4. Discussion

Obesity constitutes a serious problem in the city of Cadiz; its prevalence reaches values higher than the mean for Spain (17%

compared with 14.5%) (Aranceta et al., 1998; Rodríguez-Artalejo et al., 2002).

With increasing age, an increase of the proportion of obese subjects is observed; the highest prevalence is reached in the age group of 55–60 years (Martínez Ross et al., 2001), although studies such as that of Gutierrez-Fisac et al. (1999) demonstrate that obesity tends to be found more and more in younger age groups, where the fastest growth is occurring. There is no unanimity in the literature on the distribution of overweight and obesity in the population according to sex. In Cadiz, as is found in the majority of the regions of Spain and in various European countries, overweight and obesity have a greater prevalence in the male sex (except between 45 and 54 years of age, in which the predominance is female) (Aranceta et al., 1998). In other countries, although the prevalence of overweight continues to be higher in men, obesity presents a clearly feminine pattern (Jacoby et al., 2003); in Cadiz, only the most advanced degrees of obesity tend to be found more often in women.

Although we have observed in our study area a higher prevalence of overweight and obesity in subjects with lower education levels, and it can be seen that BMI decreases at higher education levels, we have found a significant association between education level and the prevalence of overweight and obesity, as reported in numerous studies (Aranceta et al., 2001; Sarlio-Lahteenkorva, Silventoinen, & Lahelma, 2004). However, other authors only demonstrate an association between the education level and obesity for women (Jacoby et al., 2003). The North American survey of nutrition and health (NHAES) shows that the increase of the prevalence of obesity is currently more notable in those individuals with a lower education level, and this tendency is more accentuated in females (Jeffery & Utter, 2003); this finding could explain the greater risks of BMI ≥ 25 that we observe for the occupation of at-home workers, as in our study, this category is mainly constituted by women with lower education levels. This fact could also be linked to the consideration of rural or less developed urban zones, demonstrating that this problem is clearly influenced by socioeconomic factors. This could help to explain the elevated rates of weight problems and obesity that we find in our population that coincide with current low socioeconomic and occupational levels that facilitate habits such as elevated alcohol consumption, sedentary life styles and a food consumption pattern that strays from the traditional Mediterranean diet.

Various factors would explain why there is a larger social gradient in obesity among women than among men. It has been suggested that different social and family pressures have a stronger effect on women of a higher socioeconomic status; the difference of the incorporation of women into the work force and its relation with BMI, and a relationship between BMI and unemployment has been found in women, but not in men (Gutierrez-Fisac, Regidor, Banegas Banegas, & Rodriguez Artalejo, 2002).

We have also failed to confirm clearly in our study area the inverse relationship between employment and the prevalence of obesity that is reported by numerous authors (Hall et al., 2003). On the contrary, with respect to the employment situation, a higher prevalence of obesity is observed in subjects who are unemployed, retired, that work from home, or are less actively employed, compared with subjects in active employment. This finding could be linked to the physical activity undertaken at work and its influence on the prevalence of obesity (Entrala-Bueno, Iglesias, & de Jesús, 2003; Jakicic, 2003; Katzmarzyk, Janssen, & Ardern, 2003; Patterson, Moore, Probst, & Shinogle, 2004; Szapary, Bloedon, & Foster, 2003), since sedentary behavior constitute one of the principal epidemiological factors linked to obesity, and is also a behavior that can be highly influenced in measures to control and prevent obesity.

There is evidence that people belonging to the highest socioeconomic levels have lifestyles which contribute to energy balance, such as having more leisure–time physical activity or lower fat intake and greater prevalence of dieting; although this alone cannot completely explain the socioeconomic gradient in obesity (Rodríguez-Artalejo et al., 2002).

The relationship between the prevalence of obesity and economic differences is very important, given that phenomena such as lower education levels, the consumption of diets with higher calorie and lower fruit and vegetable content, differences in physical activities undertaken in different professional situations, etc., are all associated with reduced economic resources (Halkjaer & Sorensen, 2004; Langenberg et al., 2003; Regidor, Gutierrez-Fisac, Banegas, López-Garcia, & Rodríguez Artalejo, 2004; Sarlio-Lahteenkorva et al., 2004). In our study area, the population groups with the lowest education levels, least qualified occupations, and lowest family incomes are those in which diets of higher energy content, with less consumption of fruits and vegetables, are found. This finding demonstrates that it is in this sector of the population that nutritional education must be more influential, whereas in the higher socioeconomic levels, the control of other factors like sedentary behavior is also important (Hearty, McCarthy, Kearney, & Gibney, 2007).

We can conclude by affirming the strong relationship found between sex, marital status, employment situation and income, in the prevalence of overweight and obesity in our population. These are the factors that should be taken into account when devising a plan of intervention regarding this health problem, enabling us to identify the principal groups at risk, and to whom therapeutic and preventive intervention must be focused.

In economically underprivileged sectors of the population in our area, the intervention programs should focus on improving nutritional aspects for women, and especially women that work at home, while those programs geared towards men should focus on changing leisure–time activities that currently tend to be more focused on increasing food and alcohol consumption with a low level of physical activity.

In populations with higher education and economic levels, the interventions should be geared towards the promotion of physical activity as an indispensable complement to good nutritional habits.

References

Alvarez-Dardet, C., Alonso, J., Domingo, A., & Regidor, E. (1995). *La medición de la clase social en Ciencias de la Salud*. SG editores. Barcelona: Sociedad Española de Epidemiología.

Aranceta, J. (2003). Community nutrition. *European Journal of Clinical Nutrition, 57*, 79–81.

Aranceta, J., Pérez Rodrigo, C., Serra Majem, L., Ribas, L., Quiles Izquierdo, J., Vioque, J., et al. (1998). Prevalencia de la obesidad en España: Estudio SEEDO'97. *Medicina Clínica, 111*, 441–445.

Aranceta, J., Pérez-Rodrigo, C., Serra Majem, L., Ribas, L., Quiles Izquierdo, J., Vioque, J., et al. (2001). Influence of sociodemographic factors in the prevalence of obesity in Spain. The SEEDO '97 study. *European Journal of Clinical Nutrition, 55*, 430–435.

Aranceta-Bartrina, J., Serra-Majem Ll, & Fox-Sala, M. (2005). Moreno-Esteban B y Grupo colaborativo SEEDO. *Medicina Clínica, 125*, 460–466.

Belliste, F. (2003). Why should we study human food intake behaviour? *Nutr. Nutrition Metabolism and Cardiovascular Diseases, 13*, 189–193.

Drewnowski, A., & Spectes, S. E. (2004). Poverty and obesity: The role of energy density and energy cost. *American Journal of Clinical Nutrition, 79*, 6–16.

Entrala-Bueno, A., Iglesias, C., & de Jesús, F. (2003). Diet and physical activity. A healthful binomial. *European Journal of Clinical Nutrition, 57*, 63–65.

Goldthorpe, J. H., & Llewellyn, C. (1987). *The social grading of occupations, Oxford studies in morbility*. London: Oxford University Press.

Gutierrez-Fisac, J. L., Banegas Banegas, J. R., Artalejo, F. R., & Regidor, E. (2000). Increasing prevalence of over weight and obesity among Spanish adults, 1987–1997. *International Journal of Obesity and Related Metabolic Disorders, 24*, 1677–1682.

Gutierrez-Fisac, J. L., Regidor, E., Banegas Banegas, J. R., & Rodriguez Artalejo, F. (2002). The size of obesity differences associated with educational level in Spain, 1987 and 1995/97. *Journal of Epidemiology and Community Health, 56*, 457–460.

Gutierrez-Fisac, J. L., Rodríguez Artalejo, F., Guallar Castillon, P., Banegas Banegas, J. R., & del Rey Calero, J. (1999). Determinants of geographical variations in body mass index (BMI) and obesity in Spain. *International Journal of Obesity and Related Metabolic Disorders, 23*, 342–347.

Halkjaer, J., & Sorensen, T. I. (2004). Psychosocial and demographic determinants of regional differences in the prevalence of obesity. *Journal of Biosocial Science, 36*, 141–152.

Hall, K. D., Reeder, B. A., Muhajarine, N., & Lasiuk, G. (2003). Diet, obesity and education in three age groups of Saskatchewan women. *Canadian Journal of Dietetic Practice and Research, 64*, 181–188.

Hearty, A. P., McCarthy, S. N., Kearney, J. M., & Gibney, M. J. (2007). Relationship between attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. *Appetite, 48*(1), 1–11.

Ishizaki, M., Morikawa, Y., Nakagawa, H., Honda, R., Kawakami, N., Haratani, T., et al. (2004). The influence of work characteristics on body mass index and waist-to-hip ratio in Japanese employees. *Industrial Health, 42*, 41–49.

Jacoby, E., Goldstein, J., López, A., Nuñez, E., & López, T. (2003). Social class, family, and life-style factors associated with overweight and obesity among adults in Peruvian cities. *Preventive Medicine, 37*, 396–405.

Jakicic, J. M. (2003). Exercise in the treatment of obesity. *Endocrinology and Metabolism Clinics, 32*, 967–980.

Jeffery, R. W., & Utter, J. (2003). The changing environment and population obesity in the United States. *Obesity Research, 11*, 12–22.

Katzmarzyk, P. T., Janssen, I., & Ardern, C. I. (2003). Physical inactivity, excess adiposity and premature mortality. *Obesity Reviews, 4*, 257–290.

Langenberg, C., Hardy, R., Kuh, D., Brunner, E., & Wadsworth, M. (2003). Central and total obesity in middle-aged men and women in relation to lifetime socioeconomic status: Evidence from a national birth cohort. *Journal of Epidemiology and Community Health, 57*, 816–822.

Martínez Ross, M. T., Tormo, M. J., Navarro, C., Chirlaque, M. D., & Pérez Flores, D. (2001). Extremely high prevalence of overweight and obesity in Murcia, a Mediterranean region of south-east Spain. *International Journal of Obesity and Related Metabolic Disorders, 25*, 1372–1380.

Patterson, P. D., Moore, C. G., Probst, J. C., & Shinogle, J. A. (2004). Obesity and physical inactivity in rural America. *Journal of Rural Health, 20*, 151–159.

Prentice, A. M., & Jebb, S. A. (2001). Fast foods, energy density and obesity: A possible mechanistic link. *Obesity Reviews, 2*, 141–147.

Regidor, E., Gutierrez-Fisac, J. L., Banegas, J. R., López-Garcia, E., & Rodríguez Artalejo, F. (2004). Obesity and socioeconomic position measured at three stages of the life course in the elderly. *European Journal of Clinical Nutrition, 58*, 488–494.

Rodríguez-Artalejo, F., López García, E., Gutierrez-Fisac, J. L., Banegas Banegas, J. R., Lafuente Urdinguio, P. J., & Domínguez Rojas, V. (2002). Changes in the prevalence of overweight and obesity and the risk factors in Spain 1987–1997. *Preventive Medicine, 34*, 72–81.

Sarlio-Lahteenkorva, S., Silventoinen, K., & Lahelma, E. (2004). Relative weight and income at different levels of socioeconomic status. *American Journal of Public Health, 94*, 468–472.

Szapary, P. O., Bloedon, L. T., & Foster, G. D. (2003). Physical activity and its effects on lipids. *Current Cardiology Reports, 5*, 488–492.