



Original article

Analysis of the body composition of Spanish women with fibromyalgia

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ABSTRACT

Objectives: To describe the anthropometric profile and body composition of women from Southern Spain diagnosed with fibromyalgia (FM) and to compare the observed values with values from other studies conducted on FM patients and with national reference values.

Materials and methods: The body composition of 104 women diagnosed with FM was assessed using an eight-electrode impedance meter. The reliability of the body composition measurement was tested in a randomly selected sub-sample (n=28). The reliability study showed a test-retest systematic error close to zero in most of the parameters studied.

Results: The women with FM who were studied had a mean weight of 71.3±13.4 kg, height of 158±6 cm, body mass index of 28.6±5.1 kg/m², body fat mass of 38.6±7.6%, total body water of 31.6±3.8 L and muscle mass of 23.4±3.0 kg. In general, there were no substantial differences in weight and body mass index between women with FM and those analyzed in other Spanish and European studies involving FM patients, nor when they were compared with regional or national reference values. However, the prevalence of obesity in the women with FM under study was 33.7%, a higher figure than that from the national reference data for obesity in similarly aged women (i.e. 26.4%).

Conclusions: The results suggest that obesity is a common condition in women diagnosed with FM, its prevalence in this population being higher than the national reference values. This study provides detailed information about the body composition characteristics of women with FM.

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Análisis de la composición corporal en mujeres con fibromialgia

RESUMEN

Objetivos: Caracterizar el perfil antropométrico y de composición corporal de mujeres con fibromialgia (FM) del sur de España y compararlo con otros estudios nacionales e internacionales de similares características, así como con valores normativos de mujeres españolas.

Materiales y métodos: Se ha analizado la composición corporal de 104 mujeres diagnosticadas de FM mediante un bioimpedanciómetro de 8 electrodos. La fiabilidad de la medida fue estudiada en una submuestra seleccionada aleatoriamente (n = 28). El estudio de fiabilidad mostró un error sistemático test vs. re-test cercano a cero en la mayoría de los parámetros estudiados.

Resultados: Las mujeres con FM estudiadas tuvieron un peso promedio de 71,3 ± 13,4 kg, 158,1 ± 6 cm de altura, 28,6 ± 5,1 kg/m² de índice de masa corporal, 38,6 ± 7,6% de porcentaje graso, 31,6 ± 3,8 l de agua corporal total y 23,4 ± 3,0 kg de masa muscular. En general, no se observan diferencias importantes en peso e índice de masa corporal, tanto entre las mujeres con FM estudiadas y enfermas procedentes de otros estudios nacionales o europeos como en comparación con los valores de referencia andaluces o nacionales. Sin embargo, la prevalencia de obesidad en el grupo de mujeres con FM fue del 33,7%, un valor superior a la prevalencia de obesidad nacional en mujeres de igual rango de edad (i.e. 26,4%).

Conclusiones: Los resultados sugieren que la obesidad es una condición frecuente entre mujeres con FM, siendo su prevalencia sustancialmente superior a los valores normativos nacionales. Este estudio presenta información detallada sobre la composición corporal de mujeres con FM.

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Palabras clave:

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Introduction

Fibromyalgia (FM) is an illness characterized by a disorder of pain regulation and of unknown aetiology.¹ FM is associated with the concurrent existence of chronic, generalized, musculoskeletal pain with striking hypersensitivity at several pre-defined points (tender points).² It is related with a wide variety of symptoms, amongst which persistent fatigue, unrestful sleep, generalized stiffness, especially in the morning or after resting, anxious-depressive symptoms, and cognitive difficulties are the most outstanding.^{2,3} FM patients display a lower functional capacity, which limits their daily activities, as well as a lower health-related quality of life in comparison with control groups of the same sex and age,⁴ incurring a sizeable increase in the yearly public health care expenditure for each patient.⁵

There was a 2.4% prevalence rate of FM in Spain in 2000 according to the results of the EPISER Study.⁴ It is more common among women (4.2%) than men (0.2%) and is more frequent in rural settings (4.1%) versus urban areas (1.7%).⁴ The clinical manifestations of FM generally appear when patients are in their 40s or 50s⁴; hence, we can state that the majority of these patients are peri-menopausal. The body composition during this period of life is characterized by increased fatty tissue, particularly abdominal fat, undoubtedly owing to the loss of oestrogen and the decrease in physical activity.^{6,7} This phenomenon has been related to any number of metabolic complications, such as dyslipidaemia, insulin resistance, high blood pressure, and an increase in coronary heart diseases.⁸

In the study carried out by Yunus et al. (2002) in American females, the prevalence of overweight-obesity among women with FM was greater than it is for the normal population (61% vs 38%, respectively, with 32.2% for obesity).⁹ On the other hand, in a recent Israeli study, the percentage of obese patients reached a figure of 45%¹⁰ and 50% in another recent study.¹¹ It is difficult to determine whether a high body mass index (BMI) and/or obesity is an inherent characteristic of this disease on the basis of these works in particular, given that the specific lifestyle and characteristics of each country lead to variations in the association between FM and BMI/obesity in the different studies and geographical areas.

In contrast, the studies published to date, both national and international, fail to provide an in-depth description of the body composition of these patients, focusing almost exclusively on the description of weight and BMI^{9,12,13}; as a result, there is only a vague understanding of other, relevant parameters related with body composition in this study population (for instance, the percentage of fat or muscle mass).

The current study seeks to characterize the anthropometric and body composition profile of women with FM in southern Spain and compare it with other national and international studies having similar characteristics, as well as with the reference values for Spanish females.

Material and methods

Study sample and design

We contacted a total of 160 women, members of the association of FM patients in the province of Granada (AGRAFIM), by means of e-mail, postal mail, informative posters at the Association's headquarters, and by telephone, informing them of the evaluation protocol, as well as the characteristics and aims of the study. Finally, 110 women voluntarily consented in writing to participate in our study and allow the research personnel to use the resulting data. The study inclusion criteria were as follows: 1) to meet the diagnostic criterion of the American College of Rheumatology: widespread

pain for more than 3 months and tenderness at a pressure of 4 kg/cm in 11 or more of the 18 tender point sites²; 2) not presenting any other severe disease or psychiatric illness, such as myocardial infarction or schizophrenia.² On the basis of these inclusion criteria, both the women with primary FM (when FM presents as the sole alteration), as well as those suffering from secondary FM (when FM presents together with other diseases) were included in the study. The patients had a mean duration of 16.5±10.4 years of symptomatology and had been given a positive diagnosis of FM a mean of 6.5±3.9 years ago. The evaluation protocol carried out was approved by the Clinical Trial Ethics Committee of the "Virgen de las Nieves" Hospital.

Measurements of physical fitness and health were made in a laboratory pertaining to the Faculty of Sciences of Physical Activity and Sports at the University of Granada. Bearing in mind the patients' current symptoms of the disease and resulting stiffness in the morning,² all the tests to determine body composition were carried out between 12:00 noon and 2:00 pm from Monday to Thursday over two consecutive months during which the environmental conditions remained the same. After a physical therapist estimated the tender point sites of each patient, 6 women were excluded from the study because they did not have at least 11 of the 18 tender points; consequently, the final sample consisted of 104 women.

Determination of body composition

The body composition of the patients was analyzed by means of an 8-electrode tactile impedance meter at frequencies of 5, 50, 250, and 500 kHz (InBody 720, Biospace, Seoul, Korea). This impedance meter offers validity of both total body measurements, as well as measurements by segments and has been validated in studies that have compared it with other body composition techniques of reference.^{14,15} Moreover, its validity has been proven when analyzing body composition in obese individuals.¹⁵ This is of special interest in the case of its use for this study population, since there is a high percentage of obesity in peri-menopausal women. In all cases, measurement was made at least two hours after the last meal, having removed all clothing and metal objects, and having been standing for a minimum of 5 minutes prior to testing. In an attempt to comply strictly with the manufacturer's recommendations, other additional instructions were followed, such as not having had a shower or performed intense physical exercise in the last few hours before testing, or having drunk large amounts of fluids in the previous hour. The following variables were analyzed: height (cm), total body weight (kg), BMI (kg/m²), body fat (kg), percentage of fat (%), total body water (L), intracellular water (L), extracellular water (L), protein content (kg), skeletal muscle mass (kg), mineral content (kg), fat-free weight (kg), body fat of the right arm (kg), body fat of the left arm (kg), body fat of the trunk (kg), body fat of the right leg (kg), body fat of the left leg (kg), total oedema (extracellular water/total body water) (L), oedema of the right arm (L), oedema of the left arm (L), oedema of the trunk (L), oedema of the right leg (L), oedema of the left leg (L), and basal metabolic rate (kcal). The BMI is the coefficient that comes from dividing weight in kilogrammes by square of the height in metres. The recommendations of the World Health Organization¹⁶ have been used to establish the classifying degree of obesity: underweight if BMI is <18.5; normal weight if the range of BMI is =18.50–24.99 kg/m²; overweight if BMI = 25.00–29.99 kg/m², and obesity if BMI>30 kg/m².¹⁷

Reliability of body composition analysis

In a randomly selected sub-sample of patients (n=28), two successive measurements were made 5 minutes apart, with the

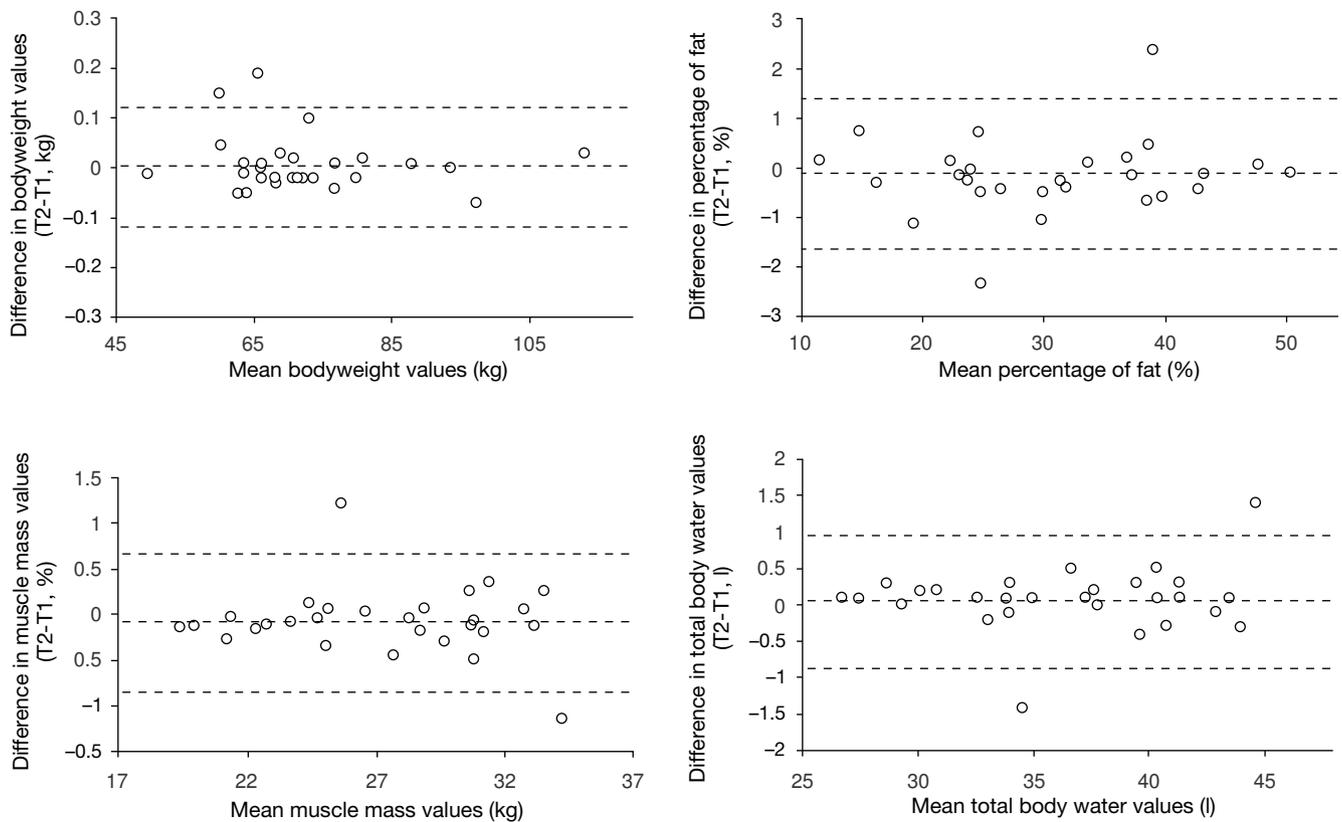


Figure. Bland-Altman plot for weight, percentage of fat, muscle mass, and total body water in patients with FM (n=28). The central line represents the mean of the differences between the second test (T2) and the first test (T1). The dotted lines represent the upper and lower limits of 95% of agreement (mean ± 1.96 of the standard deviation of the differences).

intention of studying the reliability or consistency of the measurement in this specific study population.

The reliability of the impedance meter used has been examined in accordance with the Bland-Altman method¹⁸ and is illustrated graphically by scatter plots showing the differences in each pair of measurements (test 2-test 1, hereinafter T2-T1) against the mean of each pair of measurements $[(T1+T2)/2]$. The 95% limit of agreement for all the variables of body composition was calculated as the mean of the differences ± 1.96 standard deviation (of the differences).

The Bland-Altman plots (Figure) provide a graphic representation of the reliability of the impedance meter used based on system error (mean of the differences between measurements) and the random error (95% limit of agreement). Both the system error, close to 0, as well as the limits of agreement observed, suggest that the reliability of the measurements performed in this study sample is acceptable.

Statistical analysis

The anthropometric and body composition characteristics of the sample studied are expressed as frequency and percentages for the variable of overweight or obesity and as the mean, standard deviation, and confidence interval for the remaining continuous variables. All the calculations were carried out using the statistical software package SPSS v.15.0 for Windows.

Results

Table 1 presents the degree of involvement of the illness, time since diagnosis of the disease, presence of symptomatology, and

demographic characteristics of the sample studied. The mean score obtained by the sample on the Fibromyalgia Impact Questionnaire (FIQ)¹⁹ was 65.9 ± 13.5 points and 34% exhibited severe FM based on the value observed on the FIQ (≥ 70).¹⁹ Almost three quarters of the patients (74%) were married and 60% were housewives. On the other hand, more than 40% of the women earned less than € 1,200.

Table 2 illustrates the distribution of the sample on the basis of BMI in accordance with the classifying criteria of the WHO.¹⁷ The prevalence of "underweight" was all but non-existent, whereas one third of the women studied were overweight and another third, obese.

Table 3 shows the different variables of body composition expressed as the mean (standard deviation) and the 95% confidence interval for the mean. The mean age of the women with FM studied was 50.4 ± 7.7 years, with an average weight of 71.3 ± 13.4 kg, 158.1 ± 6 cm tall, $BMI = 28.6 \pm 5.1$ kg/m², percentage of fat = 38.6 ± 7.6 , total body water = 31.6 ± 3.8 L, and muscle mass = 23.4 ± 3.0 kg.

Discussion

The study presented here provides an in-depth report of body composition in women with FM, an aspect that has been scantily studied to date, both nationally as well as internationally. The mean age of the sample analyzed was 50.4 ± 7.7 years, close to the mean age for prevalence of the disease.²⁴ Most of the studies that have explored body weight in individuals with FM have attained obesity prevalence rates that are higher than in control groups, ranging from 32%⁹ to 50%.¹¹ Our results reveal a prevalence rate of 33.7% for obesity ($BMI > 30$) in women with FM from southern Spain, a percentage that is within

Table 1
Demographic and clinical variables of the patients

Variable	% ^a
White (race)	100
Marital status	
Married	74
Single	9
Separated/divorced/widowed	17
Level of studies	
No formal qualifications	8
Finished primary school	44
Finished secondary school	21
University degree/graduate studies	27
Labour status	
Housewife	60
Student	2
Worker	24
Unemployed	7
Retired	7
Income level	
<€ 1,200	43
€ 1,201–€ 1,800	18
>€ 1,800	39
Years with symptoms (mean±standard dev.)	16.5±10.4
Mean FIQ score (mean±standard dev.)	65.9±13.5
Years since diagnosis (mean±standard dev.)	6.5±3.9
Severe fibromyalgia (FIQ≥70)	34

FIQ indicates Fibromyalgia Impact Questionnaire.

^aValues represent percentages unless stated otherwise.

Table 2
Distribution of the sample based on the World Health Organization's classifying criteria for degree of obesity

	BMI	No.	%
Underweight	<18.5	1	0.96
Normal weight	18.50–24.99	31	29.81
Overweight (pre-obesity)	25.00–29.99	37	35.58
Obesity	>30.00	35	33.65

BMI indicates Body Mass Index.

Table 3
Body composition in women with fibromyalgia (No.=104)

Variable	Mean	95% CI for the mean	
		Lower limit	Upper limit
Age, years	50.4 (7.7)	48.9	51.9
Weight, kg	71.3 (13.4)	68.7	73.9
Height, cm	158.1 (6.0)	156.9	159.2
Body mass index, kg/m ²	28.5 (5.1)	27.5	29.5
Body fat, kg	28.3 (10.2)	26.3	30.2
Percentage of fat, %	38.6 (7.6)	37.1	40.1
Total body water, L	31.6 (3.8)	30.9	32.3
Intracellular water, L	19.5 (2.3)	19.0	19.9
Extracellular water, L	12.1 (1.5)	11.9	12.4
Protein content, kg	8.4 (1.0)	8.2	8.6
Skeletal muscle mass, kg	23.4 (3.0)	22.8	24.0
Mineral content, kg	3.0 (0.4)	2.9	3.1
Fat-free weight, kg	43.0 (5.1)	42.0	44.0
Body fat of the right arm, kg	2.35 (1.23)	2.11	2.59
Body fat of the left arm, kg	2.37 (1.23)	2.13	2.61
Body fat of trunk, kg	14.29 (5.02)	13.31	15.26
Body fat of the right leg, kg	4.03 (1.31)	3.77	4.28
Body fat of the left leg, kg	4.01 (1.30)	3.76	4.26
Oedema, L	0.337 (0.004)	0.336	0.338
Oedema right arm, L	0.332 (0.003)	0.331	0.332
Oedema left arm, L	0.3327 (0.003)	0.332	0.333
Oedema of trunk, L	0.337 (0.004)	0.336	0.338
Oedema right leg, L	0.338 (0.005)	0.337	0.339
Oedema left leg, L	0.339 (0.006)	0.338	0.340
Basal metabolic rate, kcal	1,298.7 (110.7)	1,277.1	1,320.2

The data are expressed as the mean (typical deviation). CI indicates confidence interval.

the range mentioned above. However, our sample of FM patients presents a percentage of obesity in excess of the reference values indicated by the SEEDO and DORICA national studies for women from southern Spain of the same age, i.e. 28.7% and 27.6%, respectively.^{20,21} Different authors have indicated that this greater degree of obesity observed in FM patients might be the consequence of lower basal metabolic expenditure²² characteristic of this disease, partially owing to a smaller volume of muscle tissue due, in turn, to a sedentary lifestyle and the impossibility of doing many of the daily activities or physical activity, among other causes.^{22,23} Other factors that might help to account for the results observed are: co-morbid conditions accompanying FM that diminish patients' physical capacity, such as rheumatoid arthritis; the tendency toward hypothyroidism exhibited by this group of patients, or an altered neuroendocrine profile¹¹; and side effects that drugs, such as serotonin reuptake inhibitors, have on body weight.

The mean BMI of our group of women with FM is 28.5±5.1 kg/m² and the mean weight is 71.3±13.4 kg, values that are very much in line with those of other groups of patients from other European^{9,22,24} and Spanish^{12,13} studies. In Spanish studies conducted with FM patients of the same age range, BMI values ranged from 26.6±3.513 to 29.0±5.0 kg/m.^{2,12}

Although the sample size of the studies cited was relatively small (n=32 and n=33, respectively), the values seen are very similar to our figures. The mean national reference values for BMI for Spanish women with aged between 45 and 54 derived from epidemiological studies with large sample sizes (the SEEDO and DORICA studies)^{20,21,25} are approximately 27.5 kg/m².²¹ The highest prevalence rates for obesity in Spain are found in the north-western and south-south-eastern regions of the peninsula and in the Canary Islands.²¹ Therefore, in order to establish a more accurate comparison of the group of women with FM studied (from southern Spain) with reference values, it is wise to use the upper limit of the range of national reference values. The upper limit of the national data for BMI is 28.4 kg/m²,²¹ a figure that is almost identical to the one seen in the women with FM studied, indicating that their BMI is similar to the reference data for their region. In the recent study by Sotillo et al²⁵ the body composition and lifestyle habits of people from Andalusia

were analyzed, detecting a mean BMI of 27.6 ± 4.3 among women aged 40–49 and 30.2 ± 4.8 kg/m² among women aged 50–60.²⁵ If we categorize our sample based on the same age ranges, there are no important differences with respect to the reference values in the said study. The study cited used electrical bioimpedance to evaluate body composition in women from southern Spain.²⁵ The use of the same methodology to assess body composition (impedance measurement), as well as the study of women from similar geographical locations, makes it possible to compare the data derived from this study with those observed in our work. The mean percentage of fat obtained by Sotillo et al was $35.5 \pm 6.2\%$ for the range of females between 40 and 49 years of age and $38.6 \pm 5.1\%$ for the range from 50 to 60. After re-categorizing our sample for the same age ranges used in the study by Sotillo et al., the percentage of fat in the women with FM was seen to be slightly lower for the 40 to 49-year-old age group ($34.5 \pm 8.4\%$) and slightly higher for the group aged from 50 to 60 ($40.9 \pm 6.5\%$). The fat-free weight and levels of total body water in the patients with FM were all but identical to those obtained in our study.²⁵ This enables us to state that our group of FM patients does not display significant differences with respect to the reference values for the Andalusian population analyzed²⁵ once age is taken into account in these comparisons.

The fact that they display BMI values consistent with reference groups of women and that, in contrast, differences are seen with respect to the prevalence of obesity may appear to be conflicted. One possible explanation for this phenomenon would be the existence of a group of FM patients with a high awareness of the need to control their weight in order to improve the symptoms of their disease and, hence, for there to be a subgroup of thinner women who have a lower BMI, which averaged with the patients with high BMI values, would result in a mean BMI similar to that of the healthy population. It might also be said that in the healthy group, there are many more overweight females at the expense of less obesity whereas in the patient group, just the opposite is true; hence, greater obesity at the expense of a smaller percentage of overweight subjects.

We have not found any studies either in women with FM or in women without the disease that carried out such a detailed analysis of body composition, including fat and oedema by body segments, intracellular and extracellular water. As a result, it has not been possible to establish comparisons of these variables with previous studies.

In women with FM, BMI is negatively correlated with physical function, evaluated by means of the SF-36 general health questionnaire²⁶ and pain.^{9,10} Moreover, obese women with FM display greater sensitivity to pain and lower quality of life.²⁷ Furthermore, in a recent study, obese FM patients have presented less sleep and poorer quality of sleep, greater fatigue, and an altered neuroendocrine profile (levels of catecholamines, cortisol, C reactive protein, and interleukin-6).¹¹ Other studies have revealed an association between high BMI and other painful, chronic illnesses such as back pain or headache²⁸ and an overall increase in pain for all diseases.²⁷ For all these reasons, weight loss, specifically obesity prevention through physical exercise aimed at and specially adapted for this population,²⁹ as well as changes in these patients' diet,²⁴ would have important consequences for improving the quality of life of the women who suffer from this disease. Therefore, from our perspective, more physical and nutritional intervention studies are needed to establish the possible beneficial effects of physical exercise and/or diet on loss of weight in FM patients and their direct consequences on the symptomatology associated with the disease.

The present study presents a series of limitations worth noting: 1) the sample was not randomly selected, the sample size was set arbitrarily and all of the study subjects belonged to an association of FM patients; hence there is the possibility of membership bias; 2) there was no control group of women having identical characteristics and from the same geographical area, evaluated following exactly

the same methodology, and, finally, 3) the sample was limited to the Region of Andalusia and to women; studies exploring the body composition of these patients in depth are needed in other geographical areas, as well as in FM patients.

Conclusions

The present work offers a detailed description of the body composition of some one hundred odd women with FM, based on reliable measurements of body composition. The results suggest that obesity is a common condition among women with FM, with a prevalence well above that of national reference values.

This study serves to complement what we know about the disease in such an important aspect as body composition, which, in addition, is influenced by socio-cultural context, in this case, of Spain. The study reveals the need for weight loss programmes for this population.

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