Nutrición Hospitalaria

Nutr Hosp. 2015;31(6):2523-2532
ISSN 0212-1611 • CODEN NUHOEQ
S.V.R. 318

Original / *Alimentos funcionales*

Mediterranean countries facing the Mediterranean diet, are we still on track? The example of Southern Spain midlife women

Pilar Ruiz-Cabello Turmo[1], Virginia Aparicio García-Molina[1,2], M.ª del Mar Fernández Martínez[1], Natalia Moratalla Cecilia[3], Eva Gregorio Arenas[3] and Pilar Aranda Ramírez[1,2]

[1]Department of Physiology, Faculty of Pharmacy and Institute of Nutrition and Food Technology, University of Granada. [2]Department of Physical Education and Sports, Faculty of Sport Sciences, University of Granada, Granada. [3]Pinos Puente Clinical Management Unit, Metropolitan District Granada, Spain.

Abstract

Introduction and objectives: **the overall intake of a cohort of middle aged women of Granada was studied along with their body composition, anthropometric and sociodemographic characteristics to evaluate if this population does really follow a Mediterranean Diet.**

Methods: **206 women aged 53.3 ± 5.5 years old, were evaluated for their body composition, anthropometric and sociodemographic characteristics, dietary patterns, Mediterranean diet score and bone mineral density. Results were additionally analyzed across weight status categories.**

Results: **86% of the sample was overweight or obese and 14% was normal-weight (no woman was underweight). Mean body fat percentage of the sample was 40.3%. Values of bone mineral density showed a t-score average of -1.26 standard deviations. Energy intake decreased as weight status increased (p<0.05), as well as protein intake (p<0.05) but no differences were observed for carbohydrates or fat. Deviations from the Daily Recommended Intakes were observed as well as a moderate adherence (23% of the sample) to the Mediterranean Diet with no significant differences among weight status categories.**

Conclusions: **results indicated a progressive distancing from the Mediterranean dietary pattern and an unbalanced diet no correlated to the weight status group, so whether these dietary habits along with the unbalanced diet reported are prolonged over time the overweight and obese population will increase as well as the risk of developing chronic diseases, and will finally concur with the high prevalence of cardiovascular and osteoporosis risk over this population.**

(*Nutr Hosp*. 2015;31:2523-2532)

DOI:10.3305/nh.2015.31.6.8862

Key words: *Women's Health. Mediterranean diet. Obesity. Cardiovascular disease. Osteoporosis.*

Correspondence: Pilar Ruiz-Cabello Turmo.
Departamento de Fisiología, Facultad de Farmacia,
Campus de la Cartuja s/n, 18011 (Granada), Spain.
E-mail: prcturmo@correo.ugr.es

Recibido: 17-II-2015.
1.ª Revisión: 8-III-2015.
Aceptado: 10-III-2015.

LOS PAÍSES MEDITERRÁNEOS ANTE LA DIETA MEDITERRÁNEA, ¿SEGUIMOS EN EL BUEN CAMINO? EL EJEMPLO DE LAS MUJERES DE MEDIANA EDAD DEL SUR DE ESPAÑA

Resumen

Introducción y objetivos: **se estudió la ingesta dietética de una cohorte de mujeres de mediana edad de Granada, junto a sus características antropométricas y sociodemográficas, para evaluar si esta población sigue una dieta mediterránea.**

Métodos: **se evaluó la composición corporal, características antropométricas y sociodemográficas, patrones dietéticos y adhesión a la dieta mediterránea de 206 mujeres con una edad media de 53.3 ± 5.5 años. Adicionalmente, estos resultados fueron analizados por categorías de peso corporal.**

Resultados: **el 86% de la muestra presentó sobrepeso u obesidad, mientras el 14% presentó normopeso. La masa grasa corporal media fue de el 40.3%. Los valores de densidad mineral ósea presentaron un t-score medio de -1.26 desviaciones estándar. Se observó que la ingesta dietética, así como el consumo de proteína, disminuyeron a medida que aumentó el peso corporal (p<0.05 en ambos casos); sin embargo, no se observaron estas diferencias en la ingesta de hidratos de carbono ni de grasas. Existieron desviaciones respecto a las ingestas dietéticas de referencia y una moderada adhesión a la dieta mediterránea, sin observarse diferencias significativas entre las distintas categorías de peso corporal.**

Conclusiones: **los resultados sugieren un distanciamiento progresivo del patrón de dieta mediterránea y una dieta desequilibrada y no correlacionada con el peso corporal, de manera que si estos hábitos dietéticos se mantienen en el tiempo la población con sobrepeso y obesidad se incrementará y, de la misma manera, el riesgo de desarrollar enfermedades crónicas asociadas, coincidiendo finalmente con la elevada prevalencia de riesgo cardiovascular y de osteoporosis observada actualmente en esta población.**

(*Nutr Hosp*. 2015;31:2523-2532)

DOI:10.3305/nh.2015.31.6.8862

Palabras clave: *Salud de la mujer. Dieta mediterránea. Obesidad. Enfermedad cardiovascular. Osteoporosis.*

Abreviaturas

MD: Mediterranean Diet.
CVD: Cardiovascular Disease.
DRIs: Dietary Reference Intakes.
BMI: Body Mass Index.
WHO: Word Health Organisation.
NW/OW/OB: Normalweight/ Overweight/ Obesity.
WC: Waist Circumference.
MDS: Mediterranean Diet Score.

Introduction

Although Spain is one of the countries which represent the Mediterranean Diet (MD), last studies suggest that food consumption patterns and energy and nutrient intakes have changed markedly in the last forty years, differing somewhat at present from the traditional and healthy MD[1-2]. This phenomena is not unique in Spain, other countries traditionally associated to the MD are also experiencing the trend of adopting a more "westernised" lifestyle combined with limited awareness on health issues, poor dietary habits, and a sedentary lifestyle which provides an explanation for the increased risk of cardiovascular diseases (CVD) among the adult Mediterranean population[3-5].

The biological and physiological changes that occur during menopause in midlife women, along with inadequate dietary habits may result in an increased risk of developing health problems leading by obesity and diabetes, CVD, osteoporosis and certain types of cancer[6] which could reduce this population quality of life, increase their morbidity and mortality and as a consequence, increase the healthcare expenditure[7].

In this context, MD is considered a benefit to human health in general and in women in particular, in terms of both primary and secondary prevention of CVD and other chronic diseases[8-9] as well as for its benefits on the physiological and psychological changes that occur in menopause[10]. Many studies suggest a positive association between MD adherence and a significant reduction of overall mortality, cardiovascular, cancer, osteoporotic and neurodegenerative diseases incidence or mortality with just a slight increase of adherence to the MD[3,9,11]. Although not all studies show a protective effect of the MD on body weight and obesity[12-17], the evidence suggests a beneficial role of this dietary pattern and some of these studies show that the MD has a beneficial effect regarding body weight reduction and obesity[18-20].

Therefore the aims of this study are (i) to assess the level of adherence to the MD of a group of midlife south Spanish women as well as their dietary food habits, the level of compliance with the Dietary Reference Intakes (DRIs) and (ii) to study the impact and influence of weight status on these outcomes.

Methods

Participants and study design

The data reported here were obtained within the framework of a large-scaled study in the province of Granada, Andalusia. A cross-sectional epidemiological survey was conducted from February 2010 to June 2013. The recruitment of participants was performed by researchers from the Department of Physiology at the University Granada and by physicians from the main Primary Care Centers via personal interview or information panels. The inclusion criteria were: (a) women, (b) age ranged 45-65 years old, (c) not to have acute or terminal illness, (d) willingness to participate in the research. After being informed of the purpose and procedures of the study, 206 women aged 53.3±5.5 years old were included in the present study.

All the measurements were performed in a single day and by the same qualified and trained researchers to reduce inter-examiners variations. The study was reviewed and approved by the Ethics Committee of the University of Granada and informed consent was obtained from each subject.

Procedures

Anthropometry and body composition

A portable eight-polar tactile-electrode impedanciometer (InBody R20; Biospace, Gateshead, UK) was used to measure weight, body fat and skeletal muscle mass. The validity of this instrument has been reported elsewhere[21]. Height was measured using a stadiometer (Seca 22, Hamburg). Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in meters) squared and categorized following the World Health Organization (WHO) criteria: underweight (<18.5 kg/m^2), normal-weight (NW) (18.5-24.99 kg/m^2), overweight (OW) (25.0-29.99 kg/m^2) and obese (OB) (≥30.0 kg/m^2)[22]. Waist circumference (WC) was measured with the woman standing at the middle point between the ribs and ileac crest (Harpenden anthropometric tape, Holtain Ltd). Bone mineral density was measured by means of a quantitative portable ultrasound scanner (CUBA Clinical™, Sunlight Omnisense™) which measures absolute and relative values. The average relative value of bone quality used was T-score, which according to experts convened by WHO, has been recommended to define the risk of osteoporosis[23].

Dietary intake

Food consumption was assessed by a 48-h recall method validated by our group in several publications[24-25], in which the participants were interviewed and asked to recall all foods consumed during the preceding 48 hours[26]. The data recorded concerned the type of food, the amount of food consumed, the method of preparation and the ingredients used. Note was taken of the recipes, condiments, fats or oils used and the brands of the foods[27].

The questionnaire was based on open-ended questions, and photographs were used as a reference for portion size. Food intakes were converted into energy and nutrients with the help of the Spanish Food Composition database[28], using the program *Alimentación y Salud 2120-AYS-48929-40690 Version 2.0*, designed by the Institute of Nutrition and Food Technology, University of Granada. Compliance with the DRIs was calculated using the current guidelines for the Spanish population[29].

Food Frequency questionnaire

It has been used a validated food frequency questionnaire, designed by Mataix et al. in 2000[30]. It consists on a list of 78 foods on which respondent were asked the frequency of consumption (never or number of times per day, week, month or year).

Accordance with the adherence to the MD was evaluated with the Mediterranean Diet Score (MDS), an index created in 2006 by Panagiotakos et al.[17] to evaluate the degree of adherence to the traditional Mediterranean dietary pattern, which represents the traditional MD consumed in Spain at around 1960[31]. It is composed of eleven variables which scores from zero to five depending on the type of food and on de consumption frequency. The MDS ranges from 0 to 55, so that higher values indicate better MD accordance. Cut-off point analysis carried out by the same group of scientists pointed out that the optimal value was 28 as it represented the minimal score at which a decrease in the relative risk of developing coronary syndromes was observed[17]. Furthermore, individuals in the highest tertiles of the MDS[17], had 46% lower odds (odds ratio=0.54, 95% CI 0.44-0.66) of having acute coronary syndromes as compared to the individuals in the lower tertile[17]

Lifestyle and clinical history

The data for this questionnaire were compiled by personal interview with their physicians using a structured questionnaire developed by the National Health Survey (Ministry of Health and Consumer Affairs, 2001)[32].

Statistical analysis

The data were tested for normality before statistical analysis (i.e., skewness and kurtosis tests and histograms for normality), and are presented as means (typical error), unless otherwise indicated. The association between weight status and the study outcomes was examined by one-way analysis of covariance (ANCOVA) after adjustment for age. When significant, pairwise comparisons with Bonferroni's adjustment were performed to keep the experiment wise error rate to α=0.05 and to identify between which groups the differences were significant (e.g. OW vs. OB). Nominal variables such as the differences on obesity status categories were analysed using Chi-squared test All analyses were performed using the Statistical Package for Social Sciences (IBM-SPSS, version 20.0 for Windows), and the level of significance was set at 0.05. Additionally, standardized effect size statistics were estimated in all the comparisons among weight status categories. We used *Cohen's d* and its exact confidence interval for all (parametric) variables. The exact confidence intervals for *Cohen's d* were obtained by means of the non-centrality parameter of the non-central Student's distribution using Wolfram-Mathematica 8.0.

Results

Socioeconomic analysis showed that more than 50% of the individuals had a medium-income status, 80% were housewives, unemployed or retired, had no studies or primary education and 92% live with at least one relative (Table I). A positive relationship between age, occupational and socioeconomic status, household members and weight was found ($p<0.05$).

Anthropometric characteristics of the study participants are shown in Table II. 86% of the sample was OW or OB (no woman was underweight). Mean body fat percentage of the sample was 40.32% with an average value of WC of 91.4 cm. Values of bone mineral density, expressed as t-score, showed an average of -1.26 standard deviations.

Table III shows daily intakes and level of compliance with DRIs of energy and nutrients depending on BMI after being adjusted for age (data from 48-h recall). Energy intake was lower as weight status increased ($p<0.05$). Pairwise analysis showed differences between the NW compared to the OW and OB groups (both $p<0.05$). Likewise protein intake decreased as weight status increased ($p<0.05$) and pairwise analysis showed differences between the NW compared to the OW and OB groups (both $p<0.05$). No differences between weight status groups were observed for carbohydrates, total fat, saturated, monounsaturated or polyunsaturated fats. Regarding DRIs, cholesterol, protein and total fat intakes exceed it while carbohydrate intake remained under the recommendations for all weight groups. Vitamin intakes did not differ among groups except for vitamin B2 and biotin, whose intakes decreased as weight status increased and in which pairwise analysis showed differences between the NW compared to the OB group ($p<0.05$). Mine-

Table I
Sociodemographic characteristics of the study sample

		BMI (kg/m²)			p-value
		≤24.99%	25-29.99%	≥30%	
Age	45-54 years N=129 (62.6%)	11.6	62	26.4	*p<0.001*
	55-65 years N=77 (37.4%)	18.2	33.8	48.1	
	Total	14.1	51.5	34.5	
Occupational Status	Housewife/Retired N=111 (53.6%)	12.4	47.2	40.4	*p=0.038*
	Unemployed/Temporal work N=59 (28.9%)	6.2	64.6	29.2	
	Working N=36 (17.5%)	27.6	41.4	31	
	Total	13.3	51.2	35.5	
Socioeconomic Status	Low income N=76 (37%)	13.1	47.5	39.3	*p=0.045*
	Medium income N=119 (57.6%)	9.5	55.8	34.7	
	High income N=11 (5.5%)	44.4	33.3	22.2	
	Total	12.7	51.5	35.8	
Educational Status	No formal education N=28 (13.6%)	18.2	40.9	40.9	*p=0.144*
	Primary/secondary school N=135 (65.5%)	8.4	54.2	37.4	
	Professional Training/ University N=43 (20.9%)	38.1	20.2	15.5	
	Total	12.9	51.5	35.6	
Household	Alone N=16 (92.1%)	38.5	23.1	38.5	*p=0.008*
	Husband/parents/sons N=190 (7.9%)	10.5	53.9	35.5	
	Total	12.7	51.5	35.8	

BMI, body mass index.

ral intakes showed differences in sodium and chlorine whose intakes decreased as weight status increased and in which pairwise analysis showed differences between the NW compared to the OB group (both *p<0.05*). Nutritional requirements for vitamin D, zinc and iodine intake were below the recommendations for all weight status groups.

Table II
Anthropometry and body composition of the study sample

Anthropometric measures	*Mean (SD)*
Weight, kg	71.62 (12.59)
BMI, kg/m²	29.72 (5.04)
Fat mass, %	40.32 (6.31)
WC, cm	91.36 (11.72)
WC>cutoff limits, %	58.1
WC/Height Ratio	0.58 (0.07)
WC/Height Ratio >cutoff limits, %	91.9
Weight Status, NW/OW/OB (%)	14.1/51.5/34.5
t-score, standard deviations	-1.26 (1.03)

Values expressed as mean (standard deviation), otherwise indicated; SD, standard deviation; BMI, body mass index; WC, waist circumference; NW, normal-weight; OW, overweight; OB obese.

Table IV shows the Food Consumption Pattern and the level of compliance with DRIs depending on BMI (data from Food Frequency Questionnaire). No significant differences between weight status groups were observed except for sweet consumption, in which pairwise comparisons showed differences between NW and OB group *(p<0.05)*, and all groups exceed the DRIs. Other results were observed regarding the quality of the diet. None of the groups present an intake of cereals over the DRIs, neither of water, eggs, nor of fruit. Regarding meat, viscera and meat sub products (sausages, salami, etc.) and sweetened beverages, intakes exceed de DRIs.

Finally, MDS values did not show statistical differences across weight status categories and positioned women in the second tertile of the score[33].

Discussion

The findings of the study should be taken with caution due to the fact that the study sample was relatively small, of convenience, and not represen-

Table III
Energy and Nutrient Intake of the study sample across weight status categories

	Intakes					*%DRI*		
	BMI (kg/m²)					*BMI (kg/m²)*		
	≤24.99 (n=29)	*25-29.99 (n=106)*	*≥30 (n=71)*	*p-value*	*Effect size*	*≤24.99*	*25-29.99*	*≥30*
Kcal	1968.24 (94.98)*†	1688.69 (50.25)*	1645.29 (61.26)†	0.014	0.64 (0.21-1.05)	107.37 (5.92)	93.18 (3.39)	88.12 (3.89)
Proteins, g	91.36 (4.90)*†	77.13 (2.59)*	75.06 (3.16)†	0.017	0.62 (0.21-1.03)	216.76 (13.03)	186.79 (7.47)	181.03 (8.57)
Carbohydrates, g	221.63 (12.20)	193.60 (6.45)	190.51 (7.87)	0.083	0.47 (0.07-0.88)	76.34 (2.88)	76.32 (1.65)	78.69 (1.90)
Total Fat, g	82.39 (5.25)	70.80 (2.78)	69.03 (3.39)	0.090	0.47 (0.07-.088)	126.39 (5.62)	125.17 (3.23)	118.41 (3.70)
SFA, g	19.88 (1.51)	17.27 (0.80)	16.38 (0.97)	0.151	0.43 (0.03-0.84)	89.84 (5.48)	92.28 (2.90)	88.81 (3.54)
MUFA, g	36.42 (2.53)	32.37 (1.34)	31.93 (1.63)	0.298	0.33 (0.07-0.73)	138.58 (8.00)	145.61 (4.23)	145.42 (5.16)
PUFA, g	12.58 (1.55)	10.30 (0.82)	10.36 (1.00)	0.403	0.31 (0.09-0.72)	52.02 (5.21)	48.26 (2.75)	48.54 (3.36)
Cholesterol, mg	234.12 (27.24)	239.65 (14.41)	254.51 (17.57)	0.750	0.10 (0.30-0.50)	119.04 (15.19)	119.65 (8.72)	123.71 (10.00)
Fiber, g	23.06 (1.66)	20.16 (0.88)	20.97 (1.06)	0.301	0.37 (0.03-0.78)	89.68 (8.00)	83.53 (4.59)	87.69 (5.27)
Vit A,μg	1033.61 (177.00)	805.84 (93.64)	850.69 (114.16)	0.525	0.28 (0.13-0.68)	125.20 (29.92)	118.22 (17.17)	112.27 (19.69)
Vit B1,mg	1.77 (0.22)	1.59 (0.11)	1.63 (0.14)	0.764	0.18 (0.22-0.58)	222.91 (35.48)	216.72 (20.36)	212.07 (23.35)
Vit B2,mg	2.54 (0.23)*	1.96 (0.12)	1.88 (0.15)*	0.041	0.53 (0.12-0.94)	200.85 (23.09)	177.75 (13.25)	152.27 (15.20)
Vit B6,mg	2.21 (0.54)	2.33 (0.29)	1.83 (0.35)	0.551	0.19 (0.21-0.59)	133.95 (37.76)	162.00 (26.56)	114.81 (30.46)
Vit B12, μg	6.07 (2.16)	8.52 (1.14)	5.60 (1.39)	0.238	0.28 (0.12-0.68)	357.60 (74.50)	392.11 (42.74)	301.34 (49.02)
Vit C,mg	183.51 (19.64)	161.32 (10.39)	169.49 (12.67)	0.596	0.24 (0.16-0.65)	282.59 (37.56)	279.32 (21.55)	289.07 (24.71)
Vit D, μg	6.12 (1.05)	3.80 (0.56)	3.29 (0.68)	0.075	0.50 (0.09-0.91)	87.02 (19.66)	83.62 (11.28)	58.48 (12.94)
Vit E,mg	12.82 (1.26)	10.97 (0.67)	10.78 (0.81)	0.366	0.30 (0.10-0.71)	103.61 (12.57)	92.71 (7.21)	85.31 (8.27)
Niacin,mg	31.97 (3.25)	26.18 (1.72)	24.08 (2.10)b	0.127	0.45 (0.05-0.86)	230.63 (30.40)	208.71 (17.44)	174.11 (20.00)
Pantotenic Acid	4.82 (0.40)	4.69 (0.21)	4.87 (0.26)	0.861	0.11 (0.29-0.51)	-	-	-
Biotin, μg	14.13 (2.07)*	8.87 (1.10)	8.06 (1.34)*	0.041	0.55 (0.14-0.96)	-	-	-
Folate, μg	302.51 (25.92)	301.49 (13.71)	292.35 (16.71)	0.903	0.07 (0.33-0.47)	142.34 (15.57)	157.08 (8.93)	141.82 (10.24)
Sodium,mg	2357.74 (227.75)*	1832.40 (120.49)	1583.84 (146.89)*	0.014	0.69 (0.27-1.10)	117.36 (11.36)	91.83 (5.99)	79.22 (7.33)

Table III (cont.)
Energy and Nutrient Intake of the study sample across weight status categories

	Intakes					%DRI		
	BMI (kg/m²)			p-value	Effect size	BMI (kg/m²)		
	≤24.99 (n=29)	25-29.99 (n=106)	≥30 (n=71)			≤24.99	25-29.99	≥30
Potasium,mg	3247.18 (194.61)	2910.21 (102.96)	2865.11 (125.51)	0.233	0.37 (0.04-0.77)	92.78 (5.58)	83.55 (2.94)	81.91 (3.60)
Calcium,mg	910.71 (57.06)	876.34 (30.19)	834.10 (36.80)	0.480	0.25 (0.15-0.65)	104.19 (8.31)	107.55 (4.77)	98.82 (5.47)
Phosphorus,mg	1308.45 (69.22)	1153.60 (36.62)	1141.34 (44.64)	0.102	0.45 (0.04-0.86)	182.40 (10.63)	165.19 (5.40)	164.72 (6.65)
Magnesium,mg	347.16 (21.75)	309.06 (11.51)	292.36 (14.03)	0.109	0.47 (0.06-0.88)	107.08 (7.33)	103.77 (4.21)	94.48 (4.82)
Iron,mg	14.97 (3.29)	16.27 (1.74)	16.77 (2.12)	0.899	0.07 (0.33-0.48)	122.29 (40.61)	150.68 (23.30)	162.66 (26.72)
Zinc,mg	8.51 (0.68)	7.60 (0.36)	6.94 (0.44)	0.142	0.43 (0.02-0.84)	54.01 (7.27)	51.78 (4.17)	49.50 (4.78)
Iodine, μg	102.73 (14.41)	101.13 (7.62)	85.67 (9.29)	0.392	0.22 (0.18-0.62)	77.27 (13.37)	87.89 (7.67)	77.32 (8.80)
Cooper, μg	12.08 (5.56)	7.67 (2.94)	4.98 (3.59)	0.558	0.24 (0.16-0.64)	-	-	-
Chlorine,mg	2648.73 (318.62)*	2028.76 (168.57)	1705.00 (205.50)*	0.046	0.55 (0.14-0.96)	-	-	-
Manganese,mg	12.84 (4.89)	8.27 (2.59)	3.67 (3.16)	0.318	0.35 (0.05-0.75)	-	-	-
Selenium, μg	83.22 (5.70)	67.38 (3.02)	71.28 (3.67)	0.073	0.60 (0.18-1.01)	149.51 (10.38)	123.07 (5.47)	129.69 (6.69)

Values expressed as mean (standard error).SFA, Satuarted Fatty Acids; MUFA, Monounsaturated Fatty Acids; PUFA, Poliunsaturated Fatty Acids.
*,† Common superscripts in a same row indicate a significant difference (P<0.05) between the groups with the same symbol; Pairwise comparisons were performed with Bonferroni's adjustment.

tative of the region studied. On the other hand, the findings of the present study have highlighted some aspects which deeply differ from the nutrition goals for this population and concur with the general trend in Spain as well in other Mediterranean countries of showing a dangerous departure from the traditional MD which, from the 60s, has characterized this area[2,34-37]. Concretely, our results indicated that, despite than more than 93.1% of the sample was over the cut-off limits[33] only the 23% were in the highest tertiles of the MDS.

Rates of OW and OB and central adiposity (as measured through the WC and WC/height ratio) were extremely high. In fact 60% and 91.4% of the sample were over the cutoff limits respectively[38]. However, these alarming values do not differ from other epidemiological studies developed in Spain[4,39-42], neither from data from the WHO[43]. Indeed, Andalusia stands out for being one of the communities with higher prevalence of OB in the country what clearly position these women at an increased CVD risk[38,44].

The macro and micronutrients analysis of the diet showed clear deviations from the Food Consumption Guidelines developed by the Spanish Society of Community Nutrition[29]. We have observed an unbalanced daily intake of energy and macronutrients in favor of a higher consumption of proteins (190% of DRIs) and fat (122% of DRIs) and the low percentage of carbohydrates (76% of DRIs) (Fig. 1) which, as expected, is a general trend in the Spanish population[1,37,45]. This concurs with the results observed regarding to the dietary patterns in which cereals, main source of this macronutrient, were below the recommendations in all weight status groups. As expected, the contrary has been observed in meat, viscera and sub products, which were far away from the recommended intakes. This may explain the high total cholesterol intake found too, and could agree with the high prevalence of OW and OB aforementioned. The lack of cereals in the diet, mainly whole grain cereals, is in accordance with the general trend observed in other studies in Spain[1,45-46], even if in this group the intakes are slightly higher respect to

Table IV
Food frequency patterns of the study sample across weight status categories

	Intakes					%DRI		
	BMI (kg/m²)			p-value	Effect size	BMI (kg/m²)		
	≤24.99 (n=29)	25-29.99 (n=106)	≥30 (n=71)			≤24.99	25-29.99	≥30
Cereals ,svg/d	3.65 (0.24)	3.44 (0.12)	3.55 (0.15)	0.697	0.19 (0.21-0.60)	73.02 (4.77)	68.84 (2.44)	71.00 (2.99)
Dairy products svg/d	2.95 (0.22)	2.74 (0.11)	2.61 (0.14)	0.436	0.29 (0.11-0.70)	98.37 (7.45)	91.54 (3.81)	87.18 (4.66)
Vegetables (svg/d)	4.15 (0.30)	3.73 (0.15)	3.76 (0.18)	0.447	0.31 (0.09-0.71)	207.34 (14.78)	186.66 (7.55)	188.08 (9.25)
Fruits, svg/d	1.99 (0.23)	2.20 (0.12)	1.98 (0.15)	0.459	0.15 (0.55-0.25)	66.36 (7.79)	73.24 (3.98)	65.88 (4.88)
Meat and subproducts, svg/w	4.04 (0.36)	3.77 (0.18)	3.90 (0.22)	0.781	0.17 (0.23-0.57)	115.39 (10.21)	107.82 (5.22)	111.37 (6.39)
Fish, svg/w	5.12 (0.43)	4.40 (0.22)	4.83 (0.27)	0.245	0.37 (0.04-0.77)	146.29 (12.39)	125.72 (6.33)	137.87 (7.75)
Eggs, svg/w	2.32 (0.20)	2.04 (0.10)	2.19 (0.12)	0.389	0.31 (0.09-0.72)	66.36 (5.69)	58.40 (2.91)	62.73 (3.56)
Pulses, svg/w	2.94 (0.23)	2.77 (0.12)	2.71 (0.15)	0.701	0.18 (0.22-0.59)	117.64 (9.33)	111.00 (4.77)	108.37 (5.84)
Viscera and meat subproducts, svg/w	6.86 (0.84)	5.75 (0.43)	6.18 (0.53)	0.481	0.11 (0.51-0.29)	342.88 (41.98)	287.46 (21.46)	308.95 (26.28)
Sugar and Sweets, svg/w	9.99 (1.40)	8.81 (0.72)*	6.63 (0.88)*	0.036	0.49 (0.08-0.89)	666.23 (93.50)	587.16 (47.79)	441.86 (58.53)
Fats, svg/w	3.04 (0.15)	2.88 (0.08)	2.98 (0.09)	0.537	0.14 (0.55-0.26)	-	-	-
Alcoholic beverages, svg/w	3.70 (0.69)	2.58 (0.41)	2.06 (0.50)	0.221	0.32 (0.73-0.08)	-	-	-
Non-alcoholic beverages, svg/w	2.88 (1.12)	3.15 (0.57)	3.71 (0.70)	0.759	0.14 (0.54-0.26)	192.27 (74.47)	209.77 (38.06)	247.46 (46.61)
Water (ml/day)	1205 (130)	1310 (65)	1317 (80)	0.737	0.18 (0.58-0.22)	60.24 (6.48)	65.54 (3.31)	65.85 (4.05)
MDS	34.04 (0.95)	33.14 (0.49)	33.64 (0.60)	0.651	0.20 (0.19-0.61)	-	-	-

Values expressed as mean (standard error). MDS, Mediterranean Diet Score
*,† Common superscripts in a same row indicate a significant difference (P<0.05) between the groups with the same symbol; Pairwise comparisons were performed with Bonferroni's adjustment.

those previously mentioned. Since the 1960's, cereals and its derivates have shown a marked decreased (434 g/day in 1964 vs. 214 g/day in 2006)[1] and still is bread the most important food within this group in which has been observed that white bread consumption represented 2/3 of total bread intake while whole bread represented 1/3. Although last studies have demonstrated that the consumption of dietary fiber and whole grain intake is inversely related to obesity, type two diabetes, cancer and CVD[47-48], it seems like the message has not been taken hold onto the general population, who is still in the wrongly believe that bread contributes to weight gain, which is not true in the case of whole grain type[46]. In the same trend is the consumption of eggs which was under the recommendations in all weight status groups following a decreased since the 2000 (4.6 medium-size eggs/week vs 3.7 medium-size eggs/week in 2006)[1,49]. The decline in egg consumption is probably due to the general concern that eggs are 'unhealthy', based on their cholesterol content. Although it is true that eggs contain cholesterol, it must be remembered that the consumption of saturated fatty acids has a higher influence on cholesterol levels than dietary cholesterol[1]. Fruits consumption still remained under the recommendations accordingly to other Spanish studies[1,45]. Nevertheless, its consump-

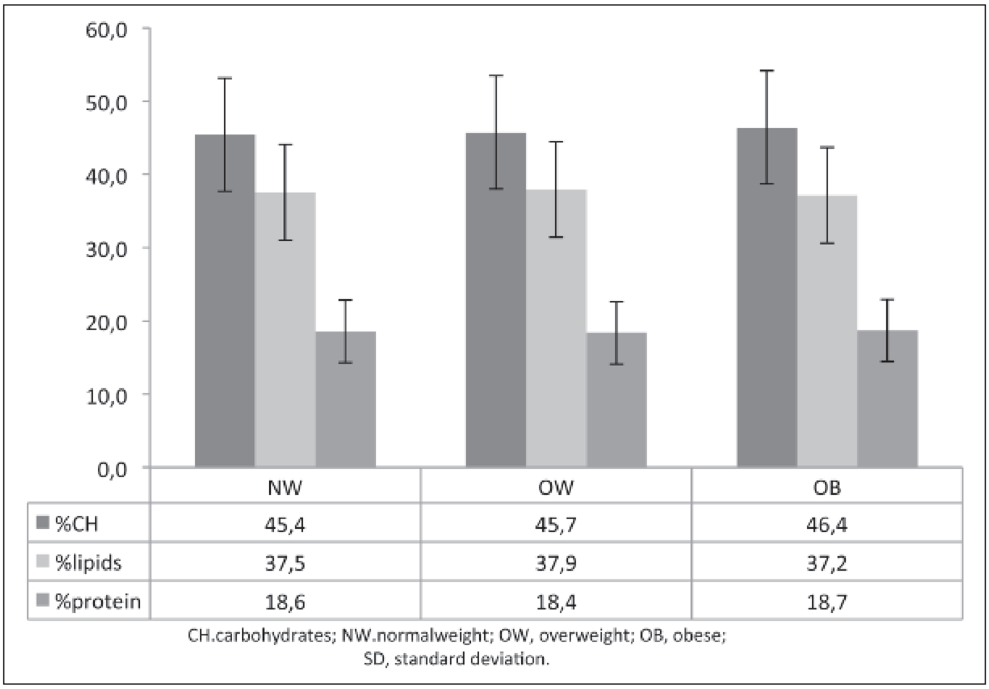

Fig. 1.—Percentaje of Kcal provided by macronutrients across weight status categories.

tion, when compared with 1964 data, has nearly doubled[1,45,49]. Finally water consumption it has been also found to be inadequate with almost the whole sample below the 2/3 of the recommendations. Nonetheless, comparisons with other studies have been difficult to conduct due to the lack of consensus about the methodology used[50-51] and the scarcity of them[52]. Since water is considered an essential nutrient for life it should be taken into account in every nutrient assessment study. Unfortunately, most studies underestimate water collection as part of the diet, since it contributes with no calories and no nutrients.

In contrast, it has been observed a marked rise on total food intake, far away from recommendations especially based on viscera and meat sub products, sugar, sweets and sweetened beverages[2]. The high meat consumption observed in this study concurs with the general trend in Spain which has remained constant in the last decade[52]. Despite sweet consumption greatly exceeded the DRIs for all weight status groups, its consumption and its relation with OW and OB status is still uncertain, as studies provide a lack of consensus and inconsistent results[53]. Indeed, the results observed showed a negative correlation with BMI, as well as for Energy intake, which should be considered cautiously since it is well known that overweight and obese persons are likely to underreport intake during dietary recall[54], representing one potential limitation of our study. Nevertheless, the relationship between the consumption of sugar-sweetened beverages and body weight has become a matter of much public and scientific interest[55]. Added sugar has been evidenced as a contributor to weight gain in children and adults[53] and probably to the risk of diabetes, fractures, and dental caries[55]. The lack of a significant difference in the present study between groups may be due to the effect size, characterised by a small sample size representing the NW group.

When analysing these results as a whole and comparing it with similar studies[1], is observed that MD is at risk precisely in the Mediterranean population, and that risk does exist not only in the OW and OB population but throughout the study sample independently of their weight status, so whether these dietary habits along with the unbalanced diet reported are prolonged over time the overweight and obese population will increase as well as the risk of developing any of the aforementioned chronic diseases, and will finally concur with the high prevalence of cardiovascular[40] and osteoporosis risk over this population[56].

There are several limitations inherent in our study design. The study was observational in its nature and, although likely to be reflective of usual dietary patterns, may be subject to selection bias. Results may be biased by the use of a convenience sample and by the selection of patients who consented to the study. The study results are partially based on patient self-report, which is subject to the influence of memory and other subjective factors as the general trend of underreport by obese and overweight patients[54]. In addition, the study lacked of a high sample size and it was carried out only in midlife women, so that future studies should be replicated in other age groups. On the other hand, this study examined a complete range of nutritional behaviors and patterns in a single report, it was corrected by a potential confounder (age), with the use of published validation studies for most of the measurements[5,24-25] including dietary assessment, which allowed us to deeply explore nutritional status. Finally, the present study, further categorized the sample by weight status categories (i.e. NW, OW and OB) in order to test the presence or absence of significant differences between dietary habits and nutrient intake across weight status categories.

Conclusions

Despite that dietary guidelines warn against unhealthy-related eating behaviors, these results point to a deficient dissemination and implementation of these guidelines, as well as a progressive distancing from the Mediterranean dietary pattern. This study should stimulate further research, involving larger sample sizes, on MDS and other health indicators in understudied populations because it may in effect have the potential to find out the main deviations of the traditional MD and healthy patterns that have characterized the Mediterranean countries, and could be the key to the development of customized educational programs aimed to be effective. Indeed, initiatives such as improving nutritional education and lifestyle in this population from primary care centers could help reduce the burden of chronic diseases and their associated costs.

Finally, taking into account that in Spain most of midlife women have an important role in education and nutritional habits of their household, the beneficiaries of these initiatives could be extended and reach beyond the purpose of this project.

Conflict of interest

The authors report no conflict of interest.

Source of funding

This study was in part financially supported by the Andalusian Junta, within the framework of a large-scaled study in the province of Granada, PI339/2008, "*Evaluación y Educación Nutricional de un grupo de mujeres peri y menopáusicas integradas en un estudio de intervención multidisciplinar*". It is also part of main's authors PhD.

References

1. Varela-Moreiras G, Avila JM, Cuadrado C, del Pozo S, Ruiz E, Moreiras O. Evaluation of food consumption and dietary patterns in Spain by the Food Consumption Survey: updated information. *Eur. J. Clin. Nutr.* 2010;64 Suppl 3:S37-43.
2. Varela-Moreiras G, Ruiz E, Valero T, Avila JM, del Pozo S. The Spanish diet: an update. *Nutr. Hosp.* 2013;28 Suppl 5:13-20.
3. Manios Y, Moschonis G, Grammatikaki E, Katsaroli I, Kanelou P, Tanagra S. Nutrition education in postmenopausal women: changes in dietary and cardiovascular indices. *Maturitas* 2006;55(4):338-47.
4. Rodriguez-Rodriguez E, Lopez-Plaza B, Lopez-Sobaler AM, Ortega RM. [Overweight and obesity among Spanish adults]. *Nutr. Hosp.* 2011;26(2):355-63.
5. Aparicio VA, Ortega FB, Baeza AC, Fernandez MM, Senhaji M, Ruiz JR, et al. Fitness, fatness and cardiovascular profile in South Spanish and North Moroccan women. *Nutr. Hosp.* 2011;26(5):1188-92.
6. Eckel RH, Kahn R, Robertson RM, Rizza RA. Preventing cardiovascular disease and diabetes: a call to action from the American Diabetes Association and the American Heart Association. *Circulation* 2006;113(25):2943-6.
7. Haring B, Leng X, Robinson J, Johnson KC, Jackson RD, Beyth R, et al. Cardiovascular disease and cognitive decline in postmenopausal women: results from the Women's Health Initiative Memory Study. *J Am Heart Assoc* 2013;2(6):e000369.
8. Saulle R, Semyonov L, La Torre G. Cost and cost-effectiveness of the Mediterranean diet: results of a systematic review. *Nutrients* 2013;5(11):4566-86.
9. Sofi F, Abbate R, Gensini GF, Casini A. Accruing evidence on benefits of adherence to the Mediterranean diet on health: an updated systematic review and meta-analysis. *Am. J. Clin. Nutr.* 2010;92(5):1189-96.
10. Munoz MA, Fito M, Marrugat J, Covas MI, Schroder H, Investigators RH. Adherence to the Mediterranean diet is associated with better mental and physical health. *Brit J Nutr* 2009;101(12):1821-27.
11. Perk J, De Backer G, Gohlke H, Graham I, Reiner Z, Verschuren M, et al. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). *Eur. Heart J.* 2012;33(13):1635-701.
12. Giugliano D, Esposito K. Mediterranean diet and metabolic diseases. *Curr. Opin. Lipidol.* 2008;19(1):63-8.
13. Pitsavos C, Panagiotakos DB, Tzima N, Chrysohoou C, Economou M, Zampelas A, et al. Adherence to the Mediterranean diet is associated with total antioxidant capacity in healthy adults: the ATTICA study. *Am. J. Clin. Nutr.* 2005;82(3):694-9.
14. Ryan M, McInerney D, Owens D, Collins P, Johnson A, Tomkin GH. Diabetes and the Mediterranean diet: a beneficial effect of oleic acid on insulin sensitivity, adipocyte glucose transport and endothelium-dependent vasoreactivity. *QJM* 2000;93(2):85-91.
15. Dai J, Jones DP, Goldberg J, Ziegler TR, Bostick RM, Wilson PW, et al. Association between adherence to the Mediterranean diet and oxidative stress. *Am. J. Clin. Nutr.* 2008;88(5):1364-70.
16. Psaltopoulou T, Naska A, Orfanos P, Trichopoulos D, Mountokalakis T, Trichopoulou A. Olive oil, the Mediterranean diet, and arterial blood pressure: the Greek European Prospective Investigation into Cancer and Nutrition (EPIC) study. *Am. J. Clin. Nutr.* 2004;80(4):1012-8.
17. Panagiotakos DB, Pitsavos C, Stefanadis C. Dietary patterns: a Mediterranean diet score and its relation to clinical and biological markers of cardiovascular disease risk. *Nutr Metab Cardiovasc Dis* 2006;16(8):559-68.
18. McManus K, Antinoro L, Sacks F. A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults. *Int. J. Obes. Relat. Metab. Disord.* 2001;25(10):1503-11.
19. Mendez MA, Popkin BM, Jakszyn P, Berenguer A, Tormo MJ, Sanchez MJ, et al. Adherence to a Mediterranean diet is associated with reduced 3-year incidence of obesity. *J. Nutr.* 2006;136(11):2934-8.
20. Morales-Falo EM, Sanchez-Moreno C, Esteban A, Alburquerque JJ, Garaulet M. [Quality of the diet "before and during" a weight loss treatment based on Mediterranean Diet; behavioural therapy and nutritional education]. *Nutr Hosp* 2013;28(4):980-7.

21. Malavolti M, Mussi C, Poli M, Fantuzzi AL, Salvioli G, Battistini N, et al. Cross-calibration of eight-polar bioelectrical impedance analysis versus dual-energy X-ray absorptiometry for the assessment of total and appendicular body composition in healthy subjects aged 21-82 years. *Ann. Hum. Biol*. 2003;30(4):380-91.
22. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: executive summary. Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults. *Am. J. Clin. Nutr.* 1998;68(4):899-917.
23. Cook RB, Collins D, Tucker J, Zioupos P. The ability of peripheral quantitative ultrasound to identify patients with low bone mineral density in the hip or spine. *Ultrasound Med. Biol*. 2005;31(5):625-32.
24. Mataix J, Aranda P, Lopez-Jurado M, Sanchez C, Planells E, Llopis J. Factors influencing the intake and plasma levels of calcium, phosphorus and magnesium in southern Spain. *Eur. J. Nutr.* 2006;45(6):349-54.
25. Mataix J, Aranda P, Sanchez C, Montellano MA, Planells E, Llopis J. Assessment of thiamin (vitamin B1) and riboflavin (vitamin B2) status in an adult Mediterranean population. *Br J Nutr* 2003;90(3):661-6.
26. Bingham SA, Cassidy A, Cole TJ, Welch A, Runswick SA, Black AE, Thurnham D, Bates C, Khaw KT, Key TJ & Day NE: Methods for data collection at an individual level. Manual on methodology for food consumption studies. Eddited by ME Cameron & WA van Staveren. Oxford: Oxford University Press; 1988.
27. Gómez J, Montellano MA, García L, Llopis J. "Manual de fotografías para encuestas alimetarias" Servicio de Publicaciones. Universidad de Granada. Granada.1992
28. Mataix J, Mañas M, Llopis J, Martínez de Victoria E, Juan J, Borregón A: Tablas de composición de alimentos españoles. Edited by: Universidad de Granada. Granada; 1998.
29. Moreiras O CA, Cabrera L, Cuadrado C, editor. *Tablas de composición de alimentos/Guía de Prácticas*, 2013.
30. Mataix J, LlopisJ, Martinez de Victoria E. et al. Valoración del estado nutricional de la Comunidad Autónoma de Andalucía. Consejería de Salud. 2000.
31. Helsing E. Traditional diets and disease patterns of the Mediterranean, circa 1960. *Am. J. Clin. Nutr.* 1995;61(6 Suppl):1329S-37S.
32. Ministry of Health and Consumer Affairs: Encuesta nacional de salud, Madrid, Spain: 2001
33. Panagiotakos DB, Pitsavos C, Arvaniti F, Stefanadis C. Adherence to the Mediterranean food pattern predicts the prevalence of hypertension, hypercholesterolemia, diabetes and obesity, among healthy adults; the accuracy of the MedDietScore. *Prev Med* 2007;44(4):335-40.
34. Leon-Munoz LM, Guallar-Castillon P, Graciani A, Lopez-Garcia E, Mesas AE, Aguilera MT, et al. Adherence to the Mediterranean diet pattern has declined in Spanish adults. *J. Nutr.* 2012;142(10):1843-50.
35. Zazpe I, Sanchez-Tainta A, Toledo E, Sanchez-Villegas A, Martinez-Gonzalez MA. Dietary patterns and total mortality in a Mediterranean cohort: the SUN project. *J Acad Nutr Diet* 2014;114(1):37-47.
36. Ciprian D, Navarrete-Munoz EM, Garcia de la Hera M, Gimenez-Monzo D, Gonzalez-Palacios S, Quiles J, et al. [Mediterranean and Western dietary patterns in adult population of a Mediterranean area; a cluster analysis]. *Nutr Hosp* 2013;28(5):1741-9.
37. Ortega Anta RM, Lopez Sobaler AM. [Primeras Jornadas UCM-ASEN Avances y controversias en nutricion y salud]. *Nutr Hosp* 2014;30 Suppl 2:1-104.
38. Ashwell M, Gunn P, Gibson S. Waist-to-height ratio is a better screening tool than waist circumference and BMI for adult cardiometabolic risk factors: systematic review and meta-analysis. *Obes Rev* 2012;13(3):275-86.
39. Llaneza P, Inarrea J, Gonzalez C, Alonso A, Arnott I, Ferrer-Barriendos J. Differences in health related quality of life in a sample of Spanish menopausal women with and without obesity. *Maturitas* 2007;58(4):387-94.
40. Grau M, Elosua R, Cabrera de Leon A, Guembe MJ, Baena-Diez JM, Vega Alonso T, et al. Cardiovascular Risk Factors in Spain in the First Decade of the 21st Century, a Pooled Analysis With Individual Data From 11 Population-Based Studies: the DARIOS Study. *Rev Esp Cardiol (Engl Ed)* 2011;64(4):295-304.
41. Gutierrez-Fisac JL, Guallar-Castillon P, Leon-Munoz LM, Graciani A, Banegas JR, Rodriguez-Artalejo F. Prevalence of general and abdominal obesity in the adult population of Spain, 2008-2010: the ENRICA study. *Obes Rev* 2012;13(4):388-92.
42. Fernandez-Ruiz VE, Paniagua-Urbano JA, Sole-Agusti M, Ruiz-Sanchez A, Gomez-Marin J. [Prevalence of metabolic syndrome and cardiovascular risk in an urban area of Murcia]. *Nutr Hosp* 2014;30(5):1077-83.
43. Who media center.Fact sheet Nº 311. Visited 26thSeptember, 2014. Available at http://www.who.int/mediacentre/factsheets/fs311/en/
44. Guallar-Castillon P, Perez RF, Lopez Garcia E, Leon-Munoz LM, Aguilera MT, Graciani A, et al. Magnitude and management of metabolic syndrome in Spain in 2008-2010: the ENRICA study. *Rev Esp Cardiol (Engl Ed)* 2014;67(5):367-73.
45. Molina-Montes E, Sanchez-Cantalejo E, Martinez C, Contreras JM, Molina E, Sanchez MJ. Compliance with dietary and nutrient recommendations in the European Prospective Investigation into Cancer and Nutrition (EPIC)-Granada cohort at recruitment. *Nutr. Hosp*. 2012;27(2):572-82.
46. Bautista-Castano I, Sanchez-Villegas A, Estruch R, Martinez-Gonzalez MA, Corella D, Salas-Salvado J, et al. Changes in bread consumption and 4-year changes in adiposity in Spanish subjects at high cardiovascular risk. *Br. J. Nutr.* 2013;110(2):337-46.
47. Lattimer JM, Haub MD. Effects of dietary fiber and its components on metabolic health. *Nutrients* 2010;2(12):1266-89.
48. Moreno Franco B, Leon Latre M, Andres Esteban EM, Ordovas JM, Casasnovas JA, Penalvo JL. Soluble and insoluble dietary fibre intake and risk factors for metabolic syndrome and cardiovascular disease in middle-aged adults: the AWHS cohort. *Nutr Hosp* 2014;30(6):1279-88.
49. Ubeda N, Basagoiti M, Alonso-Aperte E, Varela-Moreiras G. [Dietary food habits, nutritional status and lifestyle in menopausal women in Spain]. *Nutr. Hosp*. 2007;22(3):313-21.
50. Nissensohn M, Castro-Quezada I, Serra-Majem L. Beverage and water intake of healthy adults in some European countries. *Int. J. Food Sci. Nutr.* 2013;64(7):801-5.
51. Marcos A, Manonelles P, Palacios N, Warnberg J, Casajus JA, Perez M, et al. Physical activity, hydration and health. *Nutr Hosp* 2014;29(6):1224-39.
52. Varela-Moreiras G. LIBRO BLANCO DE LA NUTRICIÓN, Fundacion Espanola de la Nutricion (FEN). 2013.
53. Parnell W, Wilson N, Alexander D, Wohlers M, Williden M, Mann J, et al. Exploring the relationship between sugars and obesity. *Public Health Nutr* 2008;11(8):860-6.
54. Kretsch MJ, Fong AKH, Green MW. Behavioral and body size correlates of energy intake underreporting by obese and normal-weight women. *Journal of the American Dietetic Association* 1999;99(3):300-06.
55. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. *Am. J. Clin. Nutr.* 2013;98(4):1084-102.
56. Strom O, Borgstrom F, Kanis JA, Compston J, Cooper C, McCloskey EV, et al. Osteoporosis: burden, health care provision and opportunities in the EU: a report prepared in collaboration with the International Osteoporosis Foundation (IOF) and the European Federation of Pharmaceutical Industry Associations (EFPIA). *Arch Osteoporos* 2011;6(1-2):59-155.