Nutrición Hospitalaria

Original / *Obesidad*

A strategy for weight loss based on healthy dietary habits and control of emotional response to food

Yolanda Pontes Torrado[1], Ana García-Villaraco Velasco[2], Ana Hernández Galiot[1] and Isabel Goñi Cambrodón[1]

[1]*Department of Nutrition I. School of Pharmacy. University Complutense of Madrid.*[2]*Department of Pharmaceutical Sciences and Health. School of Pharmacy. University San Pablo, CEU (Madrid), Spain.*

Abstract

Introduction: a sedentary lifestyle and unhealthy eating habits are major causes of a negative energy balance and excess body weight. The lifestyle of the Mediterranean diet eating pattern significantly reduces risk factors for non communicable diseases. Moreover, emotions have a powerful effect on feeding behavior. There is a direct relationship between food choices (type and amount), emotions and increased energy intake.

Objective: to know the emotional behavior of individuals as a function of the relation between food intake and emotions to facilitate the establishment of personalized dietary guidelines based on healthy eating habits and increase the patient fidelity until the desired weight.

Subjects and methods: 99 overweight adult people (81 women and 18 men) were subjected to a weight-reduction program based on the establishment of lifestyle and healthy eating habits. The adherence to Mediterranean dietary pattern and the effect of emotions on the choice of food and eating habits were determined using Mediterranean Diet Adherence Screener (MEDAS) and Emotional-Eater Questionnaire (EEQ) respectively.

Results: the studied population was sedentary, consumed an unhealthy diet and eating behavior was highly affected by emotions. The majority of participants, (66% of women and 71% of men) were classified as emotional eater. During the treatment program eating habits and lifestyle subjects were modified and reduced at least 10% of their body weight.

Conclusion: know the relation between food intake and emotions allows to personalize the dietary strategy for weight loss in overweight and obesity.

(*Nutr Hosp.* 2015;31:2392-2399)

DOI:10.3305/nh.2015.31.6.8736

Key words: *Healthy dietary habits. Emotional-Eater. Obesity.*

UNA ESTRATEGIA PARA DISMINUIR EL PESO CORPORAL, BASADA EN HÁBITOS ALIMENTARIOS SALUDABLES Y EL CONTROL DE LA RESPUESTA EMOCIONAL ANTE LOS ALIMENTOS

Resumen

Introducción: el sedentarismo y los hábitos alimentarios poco saludables son las principales causas de un balance energético negativo y un exceso de peso corporal. El estilo de vida del patrón de dieta mediterránea reduce significativamente los factores de riesgo de enfermedades no transmisibles. Por otra parte, las emociones tienen un poderoso efecto en el comportamiento alimentario. Existe una relación directa entre la elección de alimentos, las emociones y el aumento de la ingesta energética.

Objetivo: conocer el comportamiento emocional de los individuos para facilitar el establecimiento de pautas dietéticas personalizadas basadas en hábitos alimentarios saludables y aumentar la fidelidad del paciente hasta conseguir el peso deseado.

Material y métodos: 99 personas adultas con sobrepeso fueron sometidos a un programa de reducción de peso basado en establecer unos hábitos alimentarios y un estilo de vida saludables. La adhesión al patrón de dieta Mediterránea y el efecto de las emociones en la elección de alimentos se determinaron utilizando los cuestionarios MEDAS (Mediterranean Diet Adherence Screener) y EEQ (Emocional Eater Questionnaire), respectivamente.

Resultados: la población estudiada era sedentaria, consumía una dieta poco saludable y su conducta alimentaria era dependiente de las emociones. La mayoría de los participantes (66% mujeres y 71% hombres) fueron clasificados como comedores emocionales. Durante el programa de tratamiento, los participantes modificaron sus hábitos alimentarios y su estilo de vida, consiguiendo reducir el peso corporal en al menos un 10% respecto al peso inicial.

Conclusión: conocer la relación entre la ingesta de alimentos y las emociones permite personalizar la estrategia dietética para disminuir el peso corporal y la tasa de abandono.

(*Nutr Hosp.* 2015;31:2392-2399)

DOI:10.3305/nh.2015.31.6.8736

Palabras clave: *Hábitos dietéticos saludables. Comedor emocional. Obesidad.*

Abbreviations

BMI: Body Mass Index.
MEDAS: Mediterranean Diet Adherence Screener.
EEQ: Emotional Eater Questionnaire.
F1: Dishinibition factors.
F2: Type of food factors.
F3: Sense of guilt factors.

Introduction

Excess body weight is one of the modifiable risk factors of non communicable diseases[1]. A sedentary lifestyle and unhealthy eating habits are major causes of these diseases. Over 44% of the population, not enough physical activity and only 14% of the population can be considered active[2]. In addition, the eating habits of the population follow an unhealthy trend. A significant reduction in risk factors diseases with an increasing score for adherence to a Mediterranean diet, that is considered healthy dietary pattern, has been reported[3]. A score based on a theoretically defined Mediterranean diet is an effective preventive tool for measuring the risk of mortality and morbidity in the general population.

The Mediterranean diet, has been widely reported to be a model of healthy eating for its contribution to a favourable health status and a better quality of life[3-5]. This Mediterranean dietary pattern incorporates most of the protective factors (fruits, vegetables, legumes, whole grains, fish, olive oil) but few of the adverse dietary factors (fast food, sugar-sweetened beverages, refined grain products, energy density, and partially hydrogenated or trans-fat) for obesity[6]. However, research interest in this field has been focused on estimating adherence to the whole Mediterranean diet rather than analysing the individual components of the dietary pattern in relation to the health status of the population. This because food components of diet present synergistic and antagonist interactions and because people eat a mixture of foods. Moreover, the overall quality of a dietary pattern appears to affect adiposity and the risk of obesity to a greater extent than relative macronutrient quantity[2].

Despite being a healthy dietary pattern, only a small percentage of the population consumes a diet with these healthy features. This trend is similar in developed populations. Therefore, determining the degree of adherence to the Mediterranean dietary pattern is a good indicator of the quality of a diet[2,6,7]. It was defined through scores that estimated the conformity of the dietary pattern of the studied population with the traditional Mediterranean dietary pattern[3].

On the other hand, is well known that emotions have a powerful effect on the choice of food and eating habits and some persons eat as a response to a range of negative emotions, such as anxiety, depression, anger and loneliness and emotional eating has been associated with overeating, binge eating, bulimia nervosa, and obesity.

Several studies indicated why some people eat in response to both positive and negative emotions and situations[8-11]. Positive emotions may contribute to food consumption in normal eaters. Eating more under negative emotions may contribute to being overweight.

Each subject handled differently their attitude to food. Much of people who are overweight or obese, have conditions for emotion to food choices and eating adequate amounts.

The Community Pharmacy, as part of the Integrated Health and specifically the pharmacies distributed evenly throughout the country, offers the ability to positively interact with the population. The pharmacist as a health agent in daily contact with the patient, can provide information on eating habits, physical activity, overweight, obesity, eating behavior disorders, etc., thus participating in prevention and nutritional education programs.

This study was conducted to demonstrate how the adoption of healthy eating habits may be effective to decrease the weight in people with overweight and obesity. In addition know the emotional behavior may facilitate the establishment of personalized dietary guidelines and increase the patient fidelity (decreasing the discontinuation rate) until the desired weight.

Methods

A longitudinal study during 12 months, from September 2012 to September 2013, in users of community pharmacy in the Community of Madrid, were conducted.

Subjects

A sample of 99 participants (81 women and 18 men) ranged in age from 18 to 75 years was included in this study. Recruitment was carried out in a community pharmacy placed in the Community of Madrid. They went voluntarily or under medical prescription to apply for dietary advice for weight loss. Patient who had diseases, were referred to the appropriate specialist units. In any case, each participant was advised by the nutritionist to report to your primary care physician

The written informed consent was obtained before subjects were accepted and was performed in accordance with the Helsinki Declaration of Human Studies and the protocol was approved by the Official College of Pharmacists of Madrid.

The first experimental day, weight (Kg) and height (m) were measured in all participants, using a calibrated clinical balance and a stadiometer. Body mass index (BMI) was calculated and expressed as Kg/m^2. Normal weight was defined with BMI less than 25; overweight

if BMI values were between 25 and 29.9, while obesity was defined with a BMI higher than 30[1].

The initial body weight and changes in this parameter was weekly determined throughout the experimental period to calculate the loss in weight until the loss of at least 10% of the initial weight, which was the target. It was expressed in kg and percentage of the initial body weight.

Procedure

At baseline, the dietitian completed a general medical questionnaire assessing lifestyle, health conditions, smoking habits, sociodemographic variables, history of illness, medication use, culinary habits, food preferences and aversions, toxic habits, eating habit between meals, habitual serving size, etc. Moreover, also other questionnaires related with physical activity pattern and emotional eating were conducted.

For the assessment of adherence to the Mediterranean diet with 14-item was conducted, in a face-to-face interview with the participant, (Table I). The 14-item tool was developed in PREDIMED study that is a large trial of nutritional intervention for the primary prevention of cardiovascular disease, conducted in 11 Spanish recruiting centers[2].

The 14-item screener of Mediterranean Diet Adherence Screener (MEDAS) includes 12 questions on food consumption frequency and 2 questions on food habits considered characteristics of the Spanish Mediterranean diet. One point is given for each target achieved. The total MEDAS score ranges from 0 to 14, with a higher score indicating better Mediterranean diet accordance. The value 0 was applied when the condition was not met. MEDAS score > 9 represented strict accordance with the healthy dietary pattern and a score > 7 (mid-range value) represented modest accordance[12].

Finally, each participant filled out a questionnaire on emotional eating for use in cases of obesity, named Emotional Eater Questionnaire (EEQ). This questionnaire have been developed and validated in order to assess many aspects of the motivation to eat that may be susceptible to impair adequate food intake and body weight control[8]. This questionnaire classifies individuals as a function of the relation between food intake and emotions. Such information will permit personalized treatments by drawing up early strategies from the very beginning of treatment programs. EEQ contains 10 questions each of which have 4 possible replies: Never, sometimes, generally and always. Each reply was given a score of 1 to 4. 1 corresponds with the lower score and 4 with the healthier the behavior. For the clinical practice, the subjects were classified in four groups attending to the score obtained: Non-emotional eater, with a score between 0-5; low emotional eater, with score between 5-10; emotional eater, with score between 11-20; very emotional eater, with score between 21-30.

EEQ questions were grouped to meet three emotional aspects of participants: 1) Disinhibition factors (F_1), group of questions that refer to the lack of control in terms of eating; 2) Type of food factors (F_2), includes questions related with the type of food that patients eat more frequently in given situations; 3) Sense of guilt factors (F_3), questions refer to the sense of guilt felt by individuals when they look at the weighing scales or eat forbidden foods.

The information collected in the questionnaires formed the basis for the establishment of a customized diet program, particularly adapted according to the effect of emotions on the choice of food and eating habits. The program was based on the dietary and lifestyle patterns of Mediterranean diet[2]. Each participant received instructions (orally and in writing) on culinary techniques, size of portions, guidelines for the purchase of food and personal recommendations on physical activity.

In addition, was established the biweekly schedule to review and update the guidelines and weekly weight control. Once achieved the goal of weight loss (> 10% of initial weight), quarterly reviews were scheduled to complete the period of four years, considered optimal for the consolidation of habits[13].

Statistical analysis

Paired t-tests were used to analyze the differences in the data at the baseline and the 12-month changes. ANOVA was applied to analyze the differences in the data between the groups. Results were expressed as mean and standard error. Two-sided $p < 0.05$ was considered significant (95% confidence intervals). Statistical analysis was performed using STATGRAPHICS Plus 5.1.

Results

The distribution of participants by sex and age was indicated in the Table I. The majority were females (82%) and the age of the major part of women and men ranged between 41 and 65 years old.

Most of men and women were aged between 41 and 65 years, followed by the population between 18 and 40.

All participants went to the community pharmacy for help to lose weight because they thought that their weight was excessive. Subsequent measurement of weight and height and BMI calculation confirmed that all patients had overweight and the majority could be classified as obese people.

Most of the men presented obesity type I (BMI between 30 and 35 Kg/m2) and 11 % presented morbidly obese. However, the majority group of women (41.98 %) were classified as overweight, 35.8 % had type I obesity, and only 4.9 % presented morbidly obese, (Table I).

	Men	Women	Total
Number of participants	*18*	*81*	*99*
Age (year):			
18-40	6	17	23
41-65	10	56	66
>65	2	8	10
Weight (Kg)	104.69+3.65	80.92+1.35	85.24+15.73
Weight situation (%):			
Normopeso (BMI: 18.5-24.9 Kg/m^2)[2]	0	0	0
Overweight (BMI: 25-29.9 Kg/m^2)	11.11	41.98	36.36
Obesity (BMI: > 30 Kg/m^2)			
- Type I: (BMI: 30-34.9 Kg/m^2)	55.56	35.80	39.39
- Type II: (BMI: 35-39.9Kg/m^2)	22.22	17.28	18.18
- Morbid: (BMI: > 40 Kg/m^2)	11.11	4.94	6.06
BMI (Kg/m^2)	34.70+1.01[a]	31.82+0.53[b]	32.34+0.48
Physical activity	sedentary	sedentary	sedentary
MEDAS[3]	4.89±0.37[a]	6.30±0.18[b]	6.22±0.17

[1]Results were expressed as mean ± standard error. Different letters indicate significant differences between men and women (one-way *ANOVA*. *P* < 0.05).[2]BMI: Body mass index.[3]MEDAS: Mediterranean diet adherence screener

Other important characteristic of the studied population was the sedentary lifestyle. Only 10% of women and 5% of men did some slight activity, but not enough so that they could be classified as active people. Taking account the common physical activity, people could be classified as very sedentary[14], (Table I).

Only a small percentage of the population consumed a diet according to the characteristics of a healthy dietary pattern. Poorly suited eating habits that had a serious impact on the degree of adherence rate to Mediterranean diet pattern were detected. The most common defects in eating habits were overeating between meals; lack of time to make the purchase and preparation of food, so that participants quite often resorted to the use of ready meals, cheeses and sausages; and realization of one family meal per day.

According to the questionnaire results MEDAS (Table II), most participants used olive oil for cooking and more than 60% consumed 4 tablespoons or more.

The women ate more fruit and vegetables than men, although only 45% complied with the recommendations. Consumption of sauteed vegetables was similar in both groups. Men (80%) daily ate at least one serving of red meat and only 44% chose poultry or rabbit. However, almost 50% of women reached the MEDAS target on consumption of red meat and 75% chose poultry or rabbit.

The women ate less legumes, industrial bakery and fish than men. The consumption of nuts was not common in this population.

Regarding the consumption of drinks, only 5% and 20% of women and men respectively, drank seven or more glasses of wine per week. Men also drank more sweetened and/or carbonated beverages than women although it should be noted that in both groups, a high percentage take these beverages and only 64% of women and 50% of men achieved the target of MEDAS.

Attending to the results of EEQ, the majority of participants, (66% of women and 71% of men) were classified as emotional eater, because both men and women reached values around 11, although the group of women had slightly higher values. The distribution of participants according to the emotional response to food was indicated in Figure 1. Score values were indicated in the table III. From the score obtained and based on the grouping of the questions after principal components analysis, three important aspects could be identified for treating patients. They were desinhibition (F_1), type of food chosen (F_2), and guilt (F_3).

As was indicated in Table I, the initial weight and BMI for men were higher than the initial values of women, so the degree of obesity was higher in the male group. The weight loss expressed as Kg lost was of higher for men (12.9 Kg and 9.2 kg in males and females respectively). However, weight loss as percentage of initial weight was exactly the same for both groups (Figure 2). We also have to take into account that women needed less time (3 to 6 months) to achieve the goal of weight loss (> 10%), while the group of men needed between 6 and 12 months to achieve this objective.

Discussion

All participants in the study were overweight and obese people. They were sedentary, consumed an unhealthy diet and were also people whose eating behavior was highly dependent on the emotions aroused

A strategy for weight loss based on healthy
dietary habits and control of emotional
response to food

Nutr Hosp. 2015;31(6):2392-2399

2395

Table II
Participants who achieve each target of the MEDAS[1] score,
and accordance of food consumption with the Mediterranean diet[2]

Questions	Target	Achievement of MEDAS target	
		Women (%)	Men (%)
1. Do you use olive oil as main culinary fat?	Yes	98	100
2. How much olive oil do you consume in a given day? (including frying, salads, etc)	> 4 tablespoon/d (1 tablespoon: 13.5g)	69	72
3. How many vegetable servings do you consume per day? (consider side dishes as a half a serving)	> 2 servings/d (1 serving: 200g)	40	22
4. How many fruit units do you consume per day? (including natural fruit juices)	> 3	45	28
5. How many servings of red meat, hamburger or meat products do you consume per day?	< 1	48	22
6. How many servings of butter, margarine, or cream do you consume per day?	< 1	26	33
7. How many sweetened and/or carbonated beverages do you drink per day?	< 1	64	50
8. How many wine do you drink per week?	> 7 glasses	5	22
9. How many servings of legumes do you consume per week? (1 serving 150 g)	> 3	34	56
10. How many servings of fish or shellfish do you consume per week? (1 serving 100-150 g of fish or 4-5 units or 200 g of shellfish)	> 3	53	44
11. How many times per week do you consume commercial sweets or pastries	< 3	14	28
12. How many servings of nuts do you consume per week? (1 servings 30 g)	> 1	13	17
13. Do you preferentially consume chicken, turkey or rabbit meat instead of veal, pork, hamburgers or sausage?	Yes	75	44
14. How many times per week do you consume vegetables, pasta, rice or other dished seasoned with sauce of tomato, onion, garlic, or leek with olive oil?	> 2	49	50

[1]MEDAS, Mediterranean Diet Adherence Screener.[2]Accordance of food consumption with Mediterranean diet is defined as achieving >9 targets of MEDAS (3)

Table III
Degree of emotional eater in overweight and obese people[1]

	$F_1{}^2$	$F_2{}^2$	$F_3{}^2$	Total
Men	7.00 ± 0.88^a	2.06 ± 0.40^a	1.56 ± 0.50^a	10.61 ± 1.23
Women	6.75 ± 0.41^a	2.40 ± 0.20^a	3.62 ± 0.24^b	12.77 ± 0.63
Total	6.80 ± 0.38	2.33 ± 0.18	3.24 ± 0.24	12.37 ± 0.59

[1]Results were expressed as mean ± standard error. Different letters indicate significant differences between men and women (one-way *ANOVA*. $P < 0.05$).[2]F_1: Dishinibition factors; F_2: Type of food factors; F_3: Sense of guilt factors.

by food. Therefore, to establish the dietary guidelines was necessary to consider not only the energy balance (energy intake and energy expenditure) but also the eating behavior of each patient.

All people in this study were identified as overweight or obese patients, based on their BMI. BMI was used to assess the degree of overweight or obese at baseline, but also as a guide to measure the effectiveness of treatment for weight loss. BMI and body weight were used to monitor the weight loss and to determine the effectiveness of therapy.

The initial goal was to reduce body weight by approximately 10 percent of the initial weight. This objective was achieved by the major part of patients.
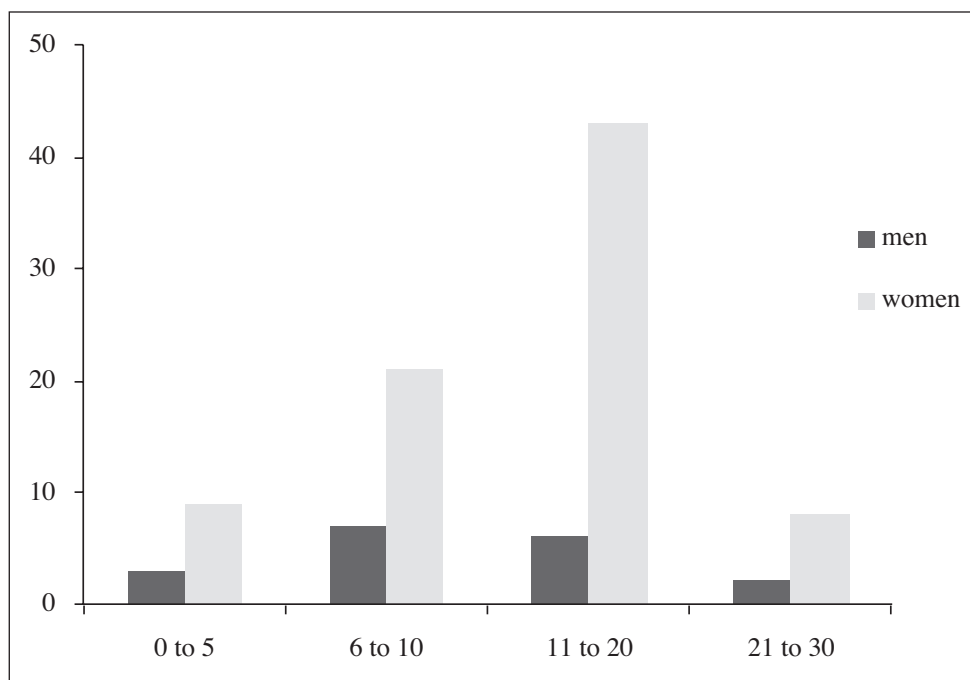
Guidelines recommend gradual weight loss for the treatment of obesity, indicative of a widely held opinion that weight lost rapidly is more quickly regained. However, Purcell et al[15] demonstrated that the rate of weight loss does not affect the proportion of weight regained after a long period of time. Furthermore, if losing weight is accompanied by nutrition education and establishing habits of healthy lifestyle, the chances that patients do not leave the weight loss program may be higher.

In the present study, only 12% of women took less than three months to lose weight agreed on; most men and almost 50% of women need more than six months.

These results were expected since we wanted to promote progressive changes in habits and lifestyle, to consolidate more strongly these changes.

Physical activity is an integral part of weight loss program because modestly it contributes to weight loss in overweight and obese adults. Moreover, regular physical activity and a prudent diet can reduce the risk
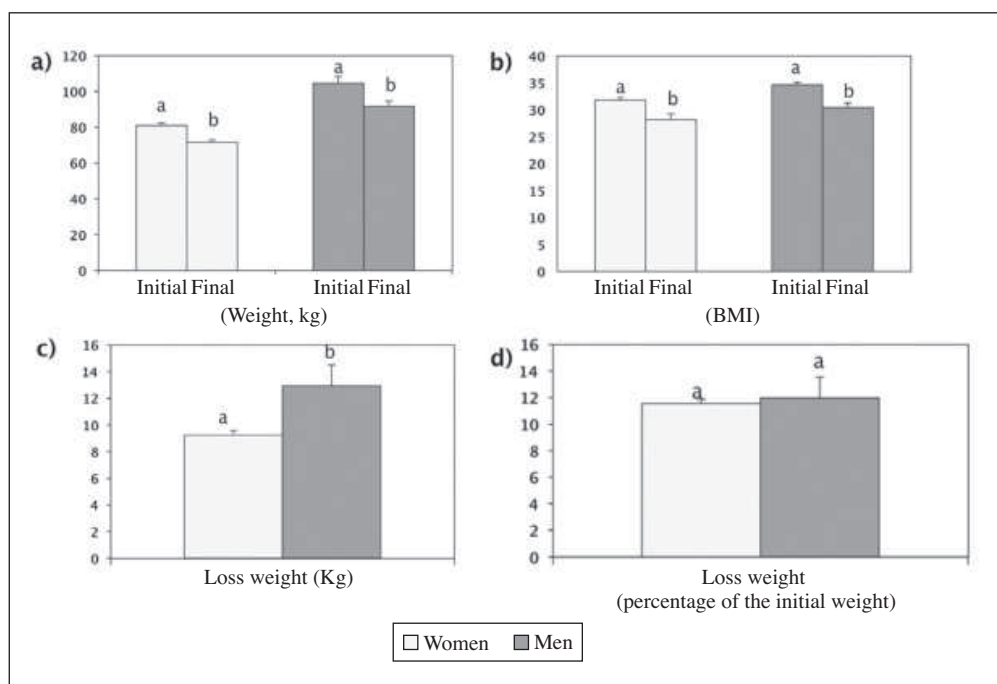
of premature death and disability from a variety of conditions including coronary heart disease, and are strongly related to the incidence of obesity[16].

Changes in physical activity habits were significant. At baseline, 90% of the population was sedentary or very sedentary, while at the end, almost all participants (90%) included daily activities such as climbing stairs, play a sport or avoid taking the bus.

Know the degree of emotion experienced by each participant with food could be used as an effective tool for driving change in food habits required to correct dietary defects of obese people. Moreover, it is important that the treatment program requires a greater frequency of contacts between the patient and the dietitian and to know the emotional behavior of participants lead to more successful weight loss and weight maintenance. Emotional eating was conceptualized as eating in response to negative affect. Many obese people in times of distress, use food as an emotional defense which, in turn, leads to obesity. On the other hand, a lot of obese persons engage in excessive eating in response to negative emotions, while normal weight persons have more adaptive coping mechanisms and do not eat in response to emotional distress. Consequently, emotional eating research, particularly in adults, has often focused on obese populations. Obviously there are a variety of affective factors that can alter the feeding behaviour, including anxiety, depression, anger, and boredom. Moreover, is interesting take in account that dietary restrained eaters are particularly vulnerable to adverse effects of stress on health, trough influences on food intake[17].

The implementation of the emotional eater questionnaire allowed differentiation three types of emotional factors and to knowledge the personality of patients facilitated establish healthy guidelines customized and adapted to each person. The distribution of the sample in the four diagnostic groups: no emotional; little emotional, emotional and very emotional, according to the total points scored in EEQ, was indicated in the figure 1. All participants were emotional eaters, but only 4.76 percent of the total sample showed the highest degree of emotionality.

The first factor, F_1 grouped the questions that refer to discontrol in terms of eating and corresponds to a tendency to lose the control over eating behavior and overeat amounts of food in response to a variety of cues and circumstances. When F_1 is high has already been described how the inability to control food-related impulses and cravings is determined by the individual character of each person. These patients showed a greatest need to develop self-control in the face of impulses since these were precisely the patients who will have greatest difficulty in achieving weight loss.

The second factor, F_2 included questions related with the type of food that patients eat most frequently in given situations. Food with high calorie content, such as ice cream, biscuits and chocolate were closely related with decontrol and were used to combat negative emotions since their consumption was associated with the production of endogenous opiates and serotonin, both directly involved with the emotions[18].

Lastly, the third factor, F_3 refers to the sense of guilt and fear felt by individuals when they look at the weighing scales or the consumption of forbidden foods. It has been described how food was converted into a conflict between guilt and pleasure in more emotional individuals[19]. Males showed higher values of F_1 and F_2 than women, while F_3 was higher in the group of women, indicating that factors related to guilt and fear affected more the usual feeding behavior of women in this study.

F_3 to be the least important factor but it could be more remarkable for some persons and useful in clinical practice since it was related to the early prediction of binge eating disorders.

As is known, overweight and obesity are consequences of a negative energy balance and some studies have shown that high adhesion to the Mediterranean diet was associated with lower BMI. These data were in line with previous findings reporting a lower risk of obesity and diabetes prevalence among PREDIMED study participants with high adherence to the MEDAS-derived PREDIMED score[20]. In addition, effective nutritional interventions required information of the extent to which the diet of population adheres to the MD and of the specific subgroups that mostly deviation from this healthy dietary pattern. The potential public health benefits from promoting a healthier lifestyle at all age but especially ages 40-74 years, are substantial[21]. Thus, the quality of the diet consumed by the studied population was evaluated.

The MEDAS adequately ranks individuals according to the adherence to the traditional Mediterranean diet. It is a general indicator of quality of the whole diet and it allows the provision of immediate feedback to the patient. Moreover, it is a good tool to change dietary habits[3], that was one of the main objectives of this work.

The goal could be achieved by changing the size of the portions, frequency of intake or cooking methods. To maintain an adequate energy balance for a healthy body weight was necessary to consider not only the caloric density of food consumed, that is, type of food consumed, but also the size of the ration. At present, the size of portions of food commonly served is increasing. This trend, originally only in the United States, has rapidly swept through the word as part of the process of globalization and a possible cause of the high prevalence of obesity.

Only 2% of the population reached a MEDAS score on strict accordance with the Mediterranean diet, and around 20 % attained a modest accordance. The majority (78%) showed no accordance with the healthy dietary pattern. It is possible that 9 point cutoff be a very rigorous goal, but even if was considered 7-point cutoff (the mid-value of the score range), the results were no good because of around 80 % of people followed an unhealthy dietary pattern.

At baseline, the diet of participants was unhealthy, both in the group of men as in women. MEDAS index

values were higher in the group of women. Around 25% of women and 17% of men showed mid-range values, and only 2.5% of women had values considered strict accordance with Mediterranean dietary pattern.

The score of MEDAS also gives specific information on the consumption of typical foods of the Mediterranean diet, such as nuts, legumes, and olive oil, and also inquires about the consumption of foods that do not fit the traditional Mediterranean diet, such as sugary soft drinks and pastries.

MEDAS was positively associated with nutrient and food intakes considered healthy, including vitamins, dietary fiber, unsaturated fatty acids, vegetables, fruits, whole grain cereals, nuts, and fish. There was an inverse relationship between MEDAS score and intakes of sodium, saturated fat, sugared beverages, and refined cereals[22].

The more detailed analysis of the responses to MEDAS questionnaire allowed to know the main usual dietary problems of individuals.

Table II shows the percentage of participants meeting the MEDAS targets and achieving accordance with the Mediterranean diet. More than 97% of individuals met the targets for using olive oil as the main cooking fat and eating foods sautéed in olive oil. Men and women only agreed habits related to the consumption of olive oil that was in accordance with the Mediterranean diet. The specific answers to the 14-point of MEDAS questionnaire were indicated in the Table II. In general, the main dietary defects were a low consumption of fruits, vegetables, legumes and fishes. While an elevated consumption of red meat, sweetened and/or carbonated beverages, commercial sweets or pastries, butter, margarine, or cream, were observed.

In conclusion, the program followed for losing weight based on establishing healthy lifestyle habits (diet and physical activity) and knowledge of emotional behavior of subjects with food, was effective and the participants achieved the target of lost weight in a relatively short period of time.

Acknowledgement

References

1. WHO Technical Report Series, 894. Obesity: Preventing and managing the global epidemic. Geneve 2000.
2. León-Muñoz LM, Guallar-Castillón P, Garciani A, López-García E, Mesas AE, Aguilera MT et al. Adherence to the Mediterranean diet pattern has declined in Spanish adults. *J Nutr* 2012; 142: 1843-1850.
3. Martínez-González MA, Corella D, Salas-Salvadó J, Ros E, Covas MI, Fiol M et al. Cohort profile: Design and methods of PREDIMED study. *Int J Epidemiol* 2012; 41: 377-385.
4. Guallar-Castillón P, Rodriguez-Artalejo F, Tormo MJ, Sánchez MJ, Rodriguez L, Quirós JR et al. Major dietary patterns and risk of coronary heart disease in middle-age persons from a Mediterranean country: The EPIC-Spain cohort study. *Nutr Metab Cardiovasc Dis* 2012; 22: 192-199.
5. Miitjavila MT, Fandos M, Salas-Salvadó J, Covas MI, Borrego S, Estruch R, et al. The Mediterranean diet improves the systemic lipid and DNA oxidative damage in metabolic syndrome individuals. A randomized, controlled trial. *Clin Nutr* 2013; 172-.178.
6. Dalen JE, Devries S. Diets to prevent coronary heart disease 1957-2013. *Am J Med* 2014; 127: 364-369.
7. Bhupathiraju SN, Tucker KL Coronary heart disease prevention: Nutrients, foods, and dietary patterns. *Clin Chimica Acta* 2011; 412: 1493-1514.
8. Garaulet M, Canteras M, Morales G, López-Guimera G, Sánchez-Carracedo Corbalán-Tutau MD. Validation of a questionnaire on emotional eating for use in cases of obesity; the Emotional Eater Questionnaire (EEQ). *Nutr Hosp* 2012; 27 (2): 645-651.
9. Melbourne Academic Mindfullness Interest Group. Mindfullness-based psychotherapies: A review of conceptual foundations, empirical evidence and practical considerations. *Aust NZJ Psychiatry* 2006; 40: 285-294.
10. Wansink B. Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annu Rev Nutr* 2004; 24: 455-479.
11. Wansink B, Painter JE, North J. Bottomless bowls: why visual cues of portion size may influence intake. *Obes Res* 2005; 13: 93-100.
12. Sánchez-Taínta A, Estruch R, Bulló M, Corella D, Gómez-García E, Fiol M et al. Adherence to a Mediterranean-type diet and reduced prevalence of clustered cardiovascular risk factors in a cohort of 3204 high-risk patients. *Eur J Cardiovasc Prev Rehabil* 2008; 15: 589-593.
13. Wadden TA, Neiberg RH, Wing RR, Clark JM, Delahanty LM, Hill JO, Krakoff J et al. Four-year weight losses in the Look AHEAD study: factors associated with long-term success. *Obesity* 2011; 19 (10): 1987-1998.
14. WHO. 1985. Energy and protein requirements: Report of a joint FAO/WHO/UNU expert consultation. Technical Report Series No. 724. Geneva 1985.
15. Purcell K, Sumithran P, Prendergast L, Bouniu C, Delbridge E, Proietto J. The effect of rate of weight loss on long-term weight management: a randomisede controlled trial. 2014; *Lancet Diabetes Endocrinol* 2014; 2 (12): 954-962.
16. King GA, Fitzhugh EC, Bassett DR, McLaughlin JE, Starth SJ, Swartz AM, Thompson DL. Relationship of leisure-time physical activity and occupational activity to the prevalence of obesity. *Int J Obes* 2001; 25 (5): 606-612.
17. Wardle J, Steptoe A, Oliver G, Lipsey Z. Stress, dietary restraint and food intake. *J Psychosom Res* 2000; 48 (2):195-202.
18. Butryn ML, Thomas JG, Lowe MR. Reductions in internal disinhibition during weight loss predict better weight loss maintenance. *Obesity* 2009; 17 (5):1101-1103.
19. Patel KA, Schlundt DG. Impact of moods and social context on eating behavior. *Appetite* 2001; 36: 111-118.
20. Serra-Majem L, Roman B, Estruch R. Scientific evidence of interventions using the Mediterranean diet: a systematic review. *Nutr Rev* 2006;64 (S): 27–47.
21. King DE, Mainous AG, Carnemolla M, Everett CJ. Adherence to healthy lifestyle habits in US adults, 1988-2006. *Am J Med* 2009; 122: 528-534.
22. Román-Viñas B, Ribas-Barba L, Ngo J, Martínez-González MA, Wijnhoven TM, Serra-Majem L. Validity of dietary patterns to assess nutrient intake adequacy. *Br J Nutr* 2009; 101 (S2): 12-20.