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Original
Choice of diet in patients with anorexia nervosa

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Abstract

Objective: **To analyse the diets chosen by anorexic patients and a control group, assessing several nutritional aspects.**

Method: **Forty-four outpatients with an initial diagnosis of restrictive anorexia nervosa (normal BMI at the time of the study) and 34 undergraduates chose their diet from a list of common foods. Nutritional content, frequency of consumption, and influence of illness and treatment duration on the diet chosen were all analysed.**

Results: **Patients' diets had a lower caloric content (P = 0.01). Their diets were also lower in niacin (P = 0.03), vitamin B12 (P = 0.04), sodium (P = 0.003), zinc (P = 0.04), phosphorus, copper and selenium (P = 0.01). Frequency of consumption was lower among patients for bread and cereals, meat and cured meats (P = 0.01), sweet foods (P = 0.001), and fatty and fried foods (P = 0.05), but higher for vegetables (P = 0.01).**

Discussion: **Patients tend to maintain some characteristic eating patterns and modify others, not so much in terms of therapeutic objectives but, rather, as a way of following more closely the usual eating patterns of the context.**

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Key words: *Diet. Anorexia nervosa. Nutrients. Micronutrients. Fat.*

ELECCIÓN DE LA DIETA EN PACIENTES CON ANOREXIA NERVIOSA

Resumen

Objetivo: **analizar las dietas elegidas por pacientes anoréxicos y un grupo control, evaluando diversos aspectos nutricionales.**

Método: **cuarenta y cuatro pacientes ambulatorios con un diagnóstico inicial de anorexia nerviosa restrictiva (IMC normal en el momento del estudio) y 34 estudiantes de bachillerato eligieron su dieta a partir de una lista de alimentos habituales. Se analizaron el contenido nutritivo, la frecuencia del consumo y la influencia de la enfermedad y la duración del tratamiento sobre la dieta seleccionada.**

Resultados: **el contenido calórico fue menor en las dietas de los pacientes (p = 0,01). Sus dietas también contenían menos niacina (p = 0,03), vitamina B12 (p = 0,04), sodio (p = 0,003), cinc (p = 0,04), fósforo, cobre y selenio (p = 0,01). La frecuencia del consumo fue menor en las pacientes con respecto al pan y cereales, la carne y los embutidos (p = 0,01), los dulces (p = 0,001), y los alimentos grasos y fritos (p = 0,05), pero mayor con respecto a los vegetales (p = 0,01).**

Discusión: **los pacientes parecían retener ciertas características de patrones de alimentación y modificar otros, no tanto en términos de objetivos terapéuticos sino, más bien, como una manera de seguir de forma más estrecha los patrones de alimentación habituales del contexto.**

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Palabras clave: *Dieta. Anorexia nerviosa. Nutrientes. Micronutrientes. Grasa.*

Introduction

Eating disorders (ED) are a common pathology,[1] the prevalence rate of anorexia nervosa being 0.5% among women.[2] Patients with ED have been reported to present a wide range of altered functioning (cardiovascular, water and electrolyte, bone, hormonal/metabolic, haematological, neurological, gastrointestinal, renal and skin), as well as micronutrient deficits,[3-8] and it has been shown that nutritional alterations contribute to these complications and mortality[9-10]. In order to learn more about the restrictions these patients place on their food intake and to develop dietary guidelines, including at primary care level, some studies have focused on their eating patterns.[11-13]

Adolescent anorexic girls have been shown to consume less fat and more fibre than their healthy peers,[12] while micronutrient deficits have been observed in adult

patients.[11] A comparison of in-patients and controls found a reduced macronutrient and calorie intake among patients, although there were no differences when comparing the calorie intake per kilogram of body weight.[14] Restrictive anorexic females have a lower fat intake than do healthy people,[15] it being shown that restriction is greater during the more severe phases of the disorder, where it has a particular effect on fats and certain micronutrients such as calcium, retinol or ascorbic acid.[16] As regards the relationship between food intake and binge eating and/or purging behaviour it has been shown that calorie intake is higher on days when both binging and purging are engaged in as compared to when just one of these behaviours is present.[17]

As regards intake and treatment it has been reported that energy density and diet variety are greater in patients who have regained weight compared to those who have not, although there are no differences in the total calorie intake.[18] There also appears to be a tendency to fall back on initial eating patterns as treatment progresses, it being very difficult to maintain any advances made in terms of increased calorie and macronutrient intake. In our country, research has found that patients only reach 94% of the recommended intake (RI) for the Spanish population as regards energy content, although protein intake is maintained.[19] Finally, reduced calorie intake has been found to be evident one year prior to illness onset, especially in terms of a reduction in fatty foods.[20]

From a methodological point of view, research has used 24-h food records,[12] analysis of foods chosen by patients[14], types of food consumed in one day,[15] retrospective questionnaires about food intake,[16] and even comparative studies of two different methods, namely, diet history and observed food intake.[11] The variety of foods consumed has been analysed in less detail, as almost all research has focused on the analysis of calorie and nutrient intake. However, in other fields the study of this variety is considered to be a good indicator of nutritional status.[21-22] In this regard it has been observed, for example, that bulimic patients have a lower intake of carbohydrates from bread and cereals than do anorexic patients or controls.[23]

The aims of the present study were to describe the dietary choices of patients with anorexia nervosa and compare them with controls, the chosen diets being evaluated in terms of nutrients, qualitative aspects and the degree to which they met the recommended intake for the Spanish population. Another goal of the study was to analyse the influence of illness and treatment duration on food choices.

Method

Participants

Subjects were 44 out-patients (36 women and 8 men; mean age 20.05 ± 1.98) with anorexia nervosa (according to DSM IV-RT criteria) and a normalised body mass index (BMI). The control group comprised 34 undergraduates (27 women and 7 men; mean age 21.79 ± 2.49) without any eating disorder and a normal BMI.

The mean illness duration was 5.04 ± 2.22 years and the mean treatment time was 1.62 ± 1.23 years. The assessment was conducted during established treatment sessions, after obtaining written informed consent for the study. BMI was calculated as the relationship between weight (in kg) and height squared (in m), the mean BMI for the patient sample being 19.95 ± 1.04. The study was performed in accordance with the Helsinki Declaration of 1975, and the research protocol for the study was approved by the Ethical Committee of the Institute of Behavioural Sciences (Seville, Spain). In the case of controls the assessment was conducted in the context of their academic studies, and once again prior written informed consent was obtained. In this case the research was approved by the Department of Nutrition and Bromatology, Pablo de Olavide University (Seville, Spain).

Choice of foods

Patients were given a set of cards, on each of which was written a type of food. These foods were drawn from a list of the most widely-consumed foods in the geographical area of the study, this comprising the following groups: cereals, dairy products, vegetables, meat, fish, eggs, pulses, fruit, cured meats, oils and fats, and sweet foods. For each food there were several cards showing different amounts of the food in question, both in grams and in measures commonly used at home.

Drawing up a diet

During the assessment each patient, in the presence of a therapist, was asked to choose the foods for their diet over a week, which had to include five servings a day. They were also able to choose amounts, method of preparation and any condiments. The same procedure was conducted with the control group. The therapist noted the choices made for subsequent nutritional assessment. Any doubts regarding amounts were resolved with the help of photographs showing the measures usually used at home.

Nutritional assessment of the chosen diet

The calculation program designed by the Centre for Advanced Studies in Nutrition and Dietetics (CESNID) of the University of Barcelona[24] was used to assess calorie content, macronutrients and the proportion of calories derived from them, micronutrients and trace elements. The frequency with which foods were chosen was also evaluated.

Table I
Protein, fat, carbohydrate and fibre content (mean ± SD) of the diets chosen

	Control group (n = 34)	AN group (n = 44)	P[1]
Protein (g)	81.00 ± 7.29	72.90 ± 16.82	0.01
Animal proteins (g)	48.17 ± 4.15	45.47 ± 10.65	NS
Vegetal proteins (g)	32.83 ± 4.57	27.43 ± 10.83	0.02
Fats (g)	84.02 ± 9.91	75.11 ± 23.75	0.04
SFA (g)	25.52 ± 3.52	22.43 ± 6.21	0.01
MUFA (g)	40.91 ± 5.20	36.25 ± 10.82	0.02
PUFA (g)	9.11 ± 1.06	8.15 ± 1.98	0.01
PUFA/SFA (g)	0.35 ± 0.30	0.36 ± 0.31	0.04
Cholesterol (mg)	351.91 ± 52.27	333.09 ± 79.27	NS
Carbohydrates (g)	246.85 ± 29.59	212.02 ± 65.48	0.005
Monosaccharides and Disaccharides (g)	94.58 ± 8.60	89.95 ± 13.10	NS
Polysaccharides (g)	144.58 ± 24.28	117.70 ± 54.68	0.009
Fibre	23.82 ± 2.52	23.54 ± 4.03	NS

[1] Student's *t* test.
SFA: saturated fatty acids; MUFA: monounsaturated fatty acids; PUFA: polyunsaturated fatty acids.

Recommended daily allowance (RDA)

Subjects were classified according to the degree to which they reached the RDA for the Spanish population, as set out in the Table of Recommended Energy and Nutrient Intake for the Spanish Population[25] and taking into account their age, sex and activity levels.

Characteristics of the diet

The Mediterranean Diet Pyramid published by the Spanish Society for Community Nutrition (SENC)[26] was used to determine the degree to which the chosen diets matched the guidelines.

Statistical analysis

Data are presented as means and standard deviations. The chi-squared test was used to determine the differences between proportions and the Student's *t* test to analyse differences between the groups. The relationship between variables was expressed by means of the Pearson correlation coefficient *(r)*. In all cases the level of significance was set at $P < 0.05$.

Results

Calorie and macronutrient content

The diet chosen by patients had a lower mean calorie content than that of controls (1,815.74 ± 508.38 *vs.*

Table II
Vitamin content of the diets chosen (mean ± SD)

	Control group (n = 34)	AN group (n = 44)	P[1]
Vitamin A (µg)	1,068.42 ± 307.56	1,087.86 ± 305.85	NS
Thiamine (mg)	1.39 ± 0.18	1.29 ± 0.34	NS
Riboflavin (mg)	1.75 ± 0.20	1.67 ± 0.41	NS
Niacin (mg)	36.76 ± 3.75	33.81 ± 7.14	0.03
Pantothenic acid (mg)	5.76 ± 0.50	5.42 ± 1.03	NS
Vitamin B6 (mg)	2.89 ± 1.04	2.23 ± 0.56	NS
Folate (µg)	347.24 ± 53.26	347.17 ± 74.34	NS
Vitamin B12 (µg)	3.99 ± 0.72	3.60 ± 0.92	0.04
Biotin (µg)	38.07 ± 13.45	34.84 ± 6.62	NS
Vitamin C (mg)	185.64 ± 26.25	198.81 ± 36.11	NS
Vitamin D (µg)	1.91 ± 1.01	1.82 ± 1.14	NS
Vitamin E (µg)	9.21 ± 0.93	9.13 ± 1.23	NS
Vitamin K (µg)	229.62 ± 58.39	229.22 ± 62.81	NS

[1] Student's *t* test.

2,123.94 ± 220.61 kcal/day; $P = 0.01$). The content of carbohydrates, proteins and fats was also lower among patients. The relationship between unsaturated and saturated fats (MUFA + PUFA/SFA) was not significantly different between patients and controls (1.97 *vs.* 1.96), the same being found for the relationship PUFA/SFA (0.36 *vs.* 0.35). Neither were there any significant differences in terms of fibre content. These data are shown in table I.

Micronutrient content

There were significant differences between the groups in the dietary content of niacin ($P = 0.03$) and vitamin B12 ($P = 0.04$). There were no significant

Table III
Presence of minerals and trace elements in the diets chosen (mean ± SD)

	Control group (n = 34)	AN group (n = 44)	P[1]
Sodium (mg)	2,211.41 ± 404.48	1,819.36 ± 653.75	0.003
Potassium (mg)	3,380.26 ± 341.93	3,220 ± 531.75	NS
Calcium (mg)	803.14 ± 83.60	776.43 ± 130.07	NS
Phosphorus (mg)	1,392.50 ± 126.27	1,279.27 ± 235.89	0.01
Magnesium (mg)	295.14 ± 26.74	278.86 ± 51.66	NS
Iron (mg)	13.97 ± 1.88	12.97 ± 3.73	NS
Zinc (mg)	8.73 ± 1.13	7.81 ± 2.37	0.04
Copper (mg)	4.38 ± 1.98	0.75 ± 0.43	0.01
Selenium (µg)	114.32 ± 14.10	101.43 ± 28.64	0.01
Iodine (µg)	94.08 ± 13.56	105.29 ± 35.19	NS
Manganese (mg)	2.55 ± 0.50	2.81 ± 0.82	NS
Chlorine (mg)	1,997.20 ± 236.14	1,825.84 ± 485.43	NS

[1] Student's *t* test.

differences for the other micronutrients, although with the exception of vitamin A and vitamin C the amounts tended to be lower among patients. As regards minerals and trace elements the amount of sodium ($P = 0.003$), phosphorus ($P = 0.01$), zinc ($P = 0.04$), copper ($P = 0.01$) and selenium ($P = 0.01$) was lower for patients. These data are shown in tables II and III.

Choice of foods

Among patients the following food groups were chosen less often: bread and cereals ($P = 0.01$), meat ($P = 0.01$), cured meats ($P = 0.01$), fatty foods ($P = 0.05$), sweet foods ($P = 0.001$) and fried foods ($P = 0.05$). Vegetables were chosen more often by patients ($P = 0.01$). These results are given in table IV.

Dietary Reference Intake (DRI)

There were significant differences between the proportions of patients and undergraduates who reached the DRI for thiamine (88.6% *vs.* 100%, respectively; $P = 0.05$), vitamin B6 (77.3% *vs.* 97.1%, respectively; $P = 0.01$), calcium (31.8% *vs.* 58.8%, respectively; $P = 0.01$), iron (20.5% *vs.* 47.1%, respectively; $P = 0.01$) and copper (86.4% *vs.* 100%, respectively; $P = 0.02$), although a higher proportion of patients compared to controls reached the DRI for folate (25% *vs.* 8.8%, respectively; $P = 0.05$).

Influence of illness and treatment duration on the diet chosen

Duration of illness was not significantly correlated with the choice of foods. As regards nutrients there was a negative and significant correlation with the lipid profile of the chosen foods when patients had been diagnosed for nine years or more. In this case the correlations were as follows: with total lipids, $r = -0.62$ ($P = 0.04$); with SFA, $r = -0.63$ ($P = 0.04$); with MUFA $r = -0.60$ ($P = 0.04$); and with PUFA, $r = -0.59$ ($P = 0-04$). The negative correlation ($r = -0.30$) between illness duration and the cholesterol content of the chosen foods was not significant.

As regards the duration of treatment there was a positive and significant correlation with sweet foods ($r = 0.33$; $P = 0.04$), but no significant correlations were observed for any other type of food.

Food pyramid for the Spanish population

In terms of the guidelines published by the Spanish Society for Community Nutrition[26] the only difference between the two groups concerned the amount of vegetables consumed, for which the recommended daily

Table IV Food frequency (mean ± SD)			
	Control group (n = 34)	AN group (n = 44)	P[1]
Bread and cereals[a]	2.44 ± 0.50	1.97 ± 0.87	0.01
Rice and pasta[b]	4.88 ± 1.73	4.34 ± 2.58	NS
Vegetables[a]	1.20 ± 0.53	2.04 ± 1.27	0.01
Pulses[b]	1.14 ± 0.60	0.90 ± 0.76	NS
Fruits[a]	2.11 ± 0.40	2.31 ± 0.56	NS
Milk, yogurt, and cheese[a]	1.29 ± 0.46	1.20 ± 0.40	NS
Potatoes[b]	4.52 ± 1.72	4.22 ± 1.85	NS
Meat[b]	5.29 ± 1.52	4.06 ± 1.63	0.01
Fish[b]	4.17 ± 1.35	3.79 ± 1.63	NS
Eggs[b]	3.91 ± 2.19	3.95 ± 2.17	NS
Cured meats[b]	3.70 ± 1.80	2.47 ± 1.84	0.01
Fats[b]	1.08 ± 0.90	0.70 ± 0.56	0.05
Sweet foods[b]	3.41 ± 1.51	2.04 ± 1.19	0.001
Fried foods[b]	3.97 ± 1.54	3.09 ± 1.99	0.05

[1] Student's *t* test.
[a] Times/day.
[b] Times/week.

intake (a minimum of two portions) was achieved by patients but not by controls (table V).

Conclusion

The diets chosen by ED patients had a lower content of total protein and plant-based proteins, fats (except cholesterol), carbohydrates and polysaccharides, this being in line with the findings of previous studies.[11,14-16] In contrast to other studies we found no differences in the amount of fibre.[12]

Table V Fit ot both sample groups to the Mediterranean Diet Pyramid published by the Spanish Society for Community Nutrition (SENC) in 2004		
	Control group (n = 34)	AN group (n = 44)
Fish and shellfish (3-4 times/week)	Yes	Yes
Meat/poultry (3-4 times/week)	Excess	Excess
Eggs (3-4 times/week)	Yes	Yes
Pulses (2-4 times/week)	Deficit	Deficit
Nuts and dried fruits (3-7 times/week)	Deficit	Deficit
Dairy products (2-4 times/day)	Deficit	Deficit
Vegetables (³2 times/day)	Deficit	Yes
Fruit (³3 times/day)	Deficit	Deficit
Bread, cereals, rice, pasta, potatoes (4-6 times/day)	Yes	Yes
Fats (occasional consumption)	Excess	Excess
Sweet foods (occasional consumption)	Excess	Excess
Cured meats (occasional consumption)	Excess	Excess

Analysis of diet quality according to the lipid profile[28] revealed PUFA/SFA and (MUFA + PUFA)/ SFA indices below the recommended levels (PUFA/ SFA > 0.5 and [MUFA + PUFA]/SFA[3]2), thus indicating that the diets chosen by both groups were rather unhealthy; this contrasts with the findings of other authors.[12] As regards cholesterol both groups consumed more than the recommended amount (< 300 mg/day), which confirms the somewhat unhealthy nature of their choices.

In terms of micronutrients the amount of sodium was adequate in both groups (< 3,000 mg/day), it being significantly below the recommended level in patients. The relationship between vitamin B6 and proteins (> 0.02) was also adequate (0.03 in both groups). In line with previous reports[16] most patients (68.2%) failed to reach the recommended levels for calcium intake and only 4.5% received enough vitamin D. These data differ considerably from those of one recent report,[12] although any comparison should be made with caution as the patients in that study included supplements in their diet. The low levels of calcium and vitamin D are relevant as regards the loss of bone density, although other factors are also involved in this loss.[29-31] In contrast to previous studies[16] most patients (79.5%) did reach recommended levels for vitamin A and all of them did so for vitamin C. As regards thiamine and riboflavin only a small percentage of patients failed to reach the recommended levels, this being consistent with previous findings.[16] The lower levels of selenium in the diets chosen by patients also coincide with the results of an earlier study,[11] as do the findings for vitamin B12 and niacin. In addition, both this and the present study found lower levels of phosphorus in diets.

With respect to the foods chosen, patients followed a characteristic pattern:[20,32] the diet they drew up was guided by the basic distinction between "good" (permitted) and "bad" (prohibited) foods, there being lower amounts of bread and cereals, meat, cured meats, fat, and sweet and fried foods. In contrast, their consumption of vegetables was higher. This highlights the need to adopt a dietetic and nutritional perspective in order to help patients attain a varied and balanced diet, one that includes all the food groups and in which each group contains a wider range of foods. In this regard, attaining normal eating habits is considered to be a better option than offering these patients a special diet of some kind.[33] It is known that in the context of ED, nutritional status may determine the success or failure of psychological treatments,[34] and therefore it is essential that eating patterns based on "good" and "bad" foods are substituted with a sufficient and balanced diet.

The present results suggest that illness duration is negatively correlated with the amount of fat in the diet, and this becomes significant in the more chronic patients. This reduced fat content has been repeatedly reported in previous studies.[11,14-16]

When considering the duration of treatment it can be seen how enormously difficult it is to change the eating habits of patients. The only observed increase was in the consumption of sweet foods which, although it may be desirable from a psychological point of view (in that it implies facing the fear of certain foods), is not a good outcome in nutritional terms. This illustrates how patients with anorexia nervosa find it very difficult to change and to maintain any change, and they repeatedly fall back on old eating habits.[19]

In the present study it is noteworthy that not only do the majority of patients fail to reach the DRI for pantothenic acid, folate, vitamin D, calcium, magnesium, iron, iodine and zinc, but that something similar occurs among the undergraduate controls. The findings for the patient group have been repeatedly reported in previous studies,[23,35-36] whereas in the case of healthy —and especially young— people some authors are now proposing the increased intake of certain micronutrients to compensate for the deficits that are commonly found.[37]

In addition to the tendency of patients to resort back to the eating habits associated with their illness the results also suggest a desire to design a diet that, broadly speaking, corresponds to the norm in our context. In recent years the Spanish diet has, overall, increased the proportion of energy derived from proteins and fats, and although this situation is beginning to improve some authors have reported that as much as 42% of dietary energy comes from fat.[38] As regards quality we also found the lipid profile to be inadequate. The increased consumption of meat in Spain is also reflected in our two groups, and this is also the case for sweet foods and cured meats. While Spanish people are reported to consume more fruit and vegetables than is the case in many neighbouring countries,[38] our undergraduate controls did not meet the requirements of the healthy eating pyramid for the Spanish population, although patients did meet the recommended level for vegetables.

The present study does have a number of limitations. Firstly, the choice of foods for the proposed diet may not coincide exactly with what patients actually ended up eating. Therefore, as a complement to the present research it would be necessary to investigate the extent to which a chosen diet matches the foods that are actually eaten. Another issue is that the choices made by patients may be subject to a degree of desirability bias due to the presence of the therapist, in other words, they may have chosen what they thought their therapist would approve of. Although the results do not appear to support this notion any future research would need to control for this possible effect. A further issue concerns family interventions. According to reports from the patients themselves the diets they chose freely differed from those that they regularly follow at home, and therefore it would be necessary to assess the extent to which the nutritional guidelines presented in the therapeutic context correspond to the eating habits followed in the family context.

The results support the need for the treatment of ED to include dietetic and nutritional work. They also highlight the strong tendency among patients to main-

tain certain eating patterns and modify others; however, this is done not so much in terms of therapeutic objectives but, rather, as a way of following more closely the usual eating patterns of the context in which they live, especially as regards micronutrients and the degree to which their diet matches the RDA and the food pyramid proposed for this context.

Acknowledgements

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