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Concern about nutrition and its relation to the food habits of a group of young university students from Madrid (Spain)

Die Besorgnis über die Ernährung und ihre Auswirkung auf die Ernährungsgewohnheiten von Universitätsstudenten in Madrid (Spanien)

Summary The aim of this investigation was to study the relationship between concern about nutrition and food consumption in 533 university students (112 men and 421 women), aged 21.7 ± 2.1 years old. Fish, dairy products and fruit were consumed in quite satisfactory quantities though cereals and vegetables were consumed less frequently than recommended. Men were found to consume greater quantities of milk, meat, bread and alcoholic drinks,

while women ate more fruit and vegetables than men.

35.4 % of subjects said they were especially concerned about the intake of fat and cholesterol, 24.5 % expressed special interest in weight control and 18.2 % recorded worries about the intake of vitamins and minerals. 21.6 % of subjects expressed no worries at all.

Multiple regression analysis showed no differences in concern about nutrition with respect to the sex or body mass index (BMI) of subjects. However, as age increased, the number of subjects expressing no concern fell whilst worries over the quantity of vitamins and minerals in the diet increased.

Worries about bodyweight were found to rise with BMI. However, amongst those who wanted to lose weight, 42.2 % of women and 7.4 % of men had a BMI < 20 kg/m². These persons, already very slim (below recommended values), still wished to lose weight and could become susceptible to nutritional imbalances.

Relationships between concerns and food habits were scarce. Although fat and cholesterol were a concern in theory, the consumption of foodstuffs such as meat and eggs was quite high. However, relationships were found between concern over the vitamin

and mineral content of the diet and the intake of supplements, and concern over bodyweight and intake of products that aid slimming. Nutrition educators may find this information useful in the design of their messages and educational programs.

Zusammenfassung Die Absicht dieser Studie war es, den Zusammenhang zwischen der Besorgtheit über Ernährung und den Lebensmittelkonsum bei 533 Universitätsstudenten (112 Männer und 421 Frauen), Durchschnittsalter 21.7 ± 2.1 Jahre, zu untersuchen. Fisch, Milchprodukte und Obst wurden in ausreichendem Maße, Getreide und Gemüse hingegen wurden in kleineren Mengen als empfohlen, gegessen. Die Männer verzehrten mehr Milch, Fleisch, Brot und alkoholische Getränke, während die Frauen mehr Obst und Gemüse als die Männer aßen.

35,4 % der Studenten äußerten Besorgnis besonders über die Aufnahme von Fett und Cholesterin, 24,5 % waren speziell an der Gewichtskontrolle interessiert und 18,2 % sagten, ihre Hauptsorge gelte der korrekten Einnahme von Vitaminen und Mineralstoffen. 21,6 % der Teilnehmer hatten keine besondere Sorge bezüglich der Ernährung. Multiple Regressionsanalysen zeigten keinen Unterschied zwischen Männern und Frauen oder dem

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Body Mass Index (BMI) auf, was die Besorgtheit über die Ernährung betrifft. Aber man stellte einen altersbedingten Unterschied fest. Mit zunehmendem Alter zeigten die Studenten mehr Interesse zum Thema „Ernährung“, vor allem im Zusammenhang mit Vitaminen und Mineralstoffen. Die Besorgnis über die Gewichtskontrolle stieg mit steigendem BMI. Von denen, die ihr Gewicht reduzieren wollten, hatten allerdings 42,2 % der Frauen gegenüber 7,4 % der Männer einen BMI von $< 20 \text{ kg/m}^2$. Da diese Studenten bereits sehr schlank waren (un-

ter den empfohlenen Werten), aber trotzdem noch Gewicht verlieren wollten, könnte dies zu Mangelerscheinungen führen.

Zusammenhänge zwischen der Besorgtheit und der Ernährungsweise waren kaum zu beobachten. Obwohl die Einnahme von Fett und Cholesterin als solche Anlass zur Besorgnis war, wurden zum Beispiel relativ viel Fleisch und Eier verzehrt. Es wurde eine Beziehung gefunden zwischen der Sorge um den Vitamin- und Mineralstoffgehalt der Nahrung und der Einnahme von Nahrungsergänzungsmittel

sowie zwischen der Sorge um das Körpergewicht und der Einnahme von Produkten zur Gewichtsreduktion. Für die Lehrer der Ernährungswissenschaft kann diese Information behilflich sein, um ihre Kurse und Programme zu gestalten.

Key words Dietary habits – young university students – concerns about nutrition

Schlüsselwörter Ernährungsgewohnheit – Universitätsstudenten – Ernährungsbesorgnis

Introduction

Food selection is based upon a complex interaction of a variety of factors, both external and internal, specific to each individual (15). The external factors are usually demographic, environmental, and socioeconomic, and are relatively easy to determine (15). However, internal factors such as values, attitudes, concerns and beliefs with respect to food are more difficult to measure objectively (30). Current research suggests that attitudes and beliefs may play a larger role in food selection than previously thought – perhaps an even greater role than that played by external factors (4).

If eating habits are to be changed in order to prevent cardiovascular and other diseases, the social, psychological and mental factors influencing them must be investigated. At the present time research data available in this field are scarce (17).

Knowledge of concerns about nutrition may help clarify the psychological basis of the eating patterns of young adults and may help in the design of more effective nutrition education programs (12).

The aim of this work, complementary to increasing our knowledge about the relationship between concern over nutrition and food habits, was to determine the worries and dietary habits of a group of young Spanish university people so that mistaken beliefs and nutrition myths might be detected as a prior step to improving the group's diet, health and functional capacity.

Methods

Sample selection

Study participants were required to meet all of the following eligibility criteria: to be students of the Univer-

sidad Complutense de Madrid, to be in one of the final three years of degree courses including nutrition in their curricula (Pharmacy and Food Science and Technology), to have not yet studied this subject, to be between 19 and 30 years of age and to be in self-perceived good health. These criteria were established to provide a group of relatively homogeneous participants who would be able to carry out the necessary tasks of individual data collection.

Subjects were chosen randomly from class groups of students of the above courses. Permission for students to complete a questionnaire in place of studying a theory class was obtained from their respective teachers. Students were informed about the characteristics of the study and their voluntary participation was requested. All students in each classroom participated in these proceedings ($n = 589$), but only 90.5 % fully completed the questionnaire and met all study inclusion requirements.

The mean age of the 533 participants was 21.7 ± 2.1 years (Table 1). Within this group, 5.6 % were 19 years of age, 47.5 % were 20–21 years old, 33 % were 22–23 years old, 13.7 % were 24–25 and 4.7 % were 25 or older.

Table 1 Personal and anthropometric data ($X \pm \text{SD}$)

	Total	Males	Females
(n)	533	112	421
Age (years)	21.7 ± 2.1	21.9 ± 2.3	21.6 ± 1.9
Weight (kg)	59.0 ± 10.7	$74.1 \pm 10^*$	$54.8 \pm 6.2^*$
Height (cm)	167.2 ± 7.9	$177.3 \pm 6.1^*$	$164.4 \pm 5.7^*$
Body mass index (kg/m ²)	21.0 ± 2.4	$23.5 \pm 2.6^*$	$20.3 \pm 1.9^*$

* Significant difference between sexes ($p < 0.05$) (Student's *t*-test when normally distributed, or the Mann-Whitney test when not).

Subjects answered a questionnaire in which they indicated personal data (age, weight and height). They also indicated the frequency at which they took vitamin-mineral supplements and products that aid slimming and they filled out a "Food frequency intake" questionnaire. Subjects were asked how often they consumed 19 food and drink items, specifying the number of times they took each item daily, weekly, monthly. Items never consumed were also recorded as such.

Students indicated the length of time they spent on each of a series of activities, e.g., sleeping, eating, practicing a sport, etc., following the questionnaire of Sarria et al. (27). The type of sports they played and the time spent on them per day or per week was also indicated.

Participants were asked what their main concern was with respect to nutrition. Possible choices offered included the content of minerals and vitamins in the diet, weight control, fat and cholesterol intake, salt intake, other concerns, no concerns, no answer and no opinion. All subjects answered questions following the instructions of a trained nutritionist. Upon collection, these records were reviewed for errors and completeness.

A prospective method involving the keeping of a "weighed food record" was followed over 5 consecutive days (including a Sunday) by 70 students chosen at random from the 533 participants. The subjects' questionnaire answers were then contrasted with this record in order to validate responses. The "weighed food record" showed that milk products were taken 15.1 ± 4.2 times/week, meats 6.4 ± 2.2 times/week, fish 3.9 ± 2.8 times/week, eggs 4.0 ± 1.6 times/week, fruits 13.1 ± 4.6 times/week, and cereals 14.8 ± 5.6 times/week. No significant differences were seen between these figures and those of the food frequency questionnaires that each of the 70 subjects answered (milk products 14.6 ± 7.0 times/week, meats 6.8 ± 3.9 times/week, fish 4.9 ± 3.4 times/week, eggs 4.6 ± 2.8 times/week, fruits 15.1 ± 9 times/week and cereals 12.7 ± 7.4 times/week).

Means, SD and the percentage of answers to different questions are shown. Differences according to sex were calculated using Student's *t*-test. When non normal distribution was found the non parametric Mann-Whitney test was used. Multiple regression analysis was used to determine differences for a given parameter with respect to age, sex or body mass index (BMI). In some cases the influence of concern about nutrition was also considered in this type of analysis. Differences were considered statistically significant at $p < 0.05$.

Results

The characteristics of the sample are presented in Table 1. Compared to women, men show a higher consumption of milk ($p < 0.05$), meat products ($p < 0.05$), bread

($p < 0.05$) and alcoholic drinks ($p < 0.05$). Women eat more fruit ($p < 0.05$) and vegetables ($p < 0.1$) (Table 2).

Table 2 Food Consumption Frequency (times/week) ($X \pm SD$)

	Total	Males	Females
Milk	13.7 ± 7.5	$14.9 \pm 7.9^*$	$13.4 \pm 7.3^*$
Cheese	2.0 ± 4.1	1.9 ± 3.7	2.0 ± 4.3
Yoghurt	1.8 ± 3.5	1.5 ± 2.8	1.8 ± 3.7
Meat products	6.0 ± 3.4	$6.6 \pm 3.7^*$	$5.8 \pm 3.3^*$
Sausages	1.5 ± 2.5	1.7 ± 2.8	1.4 ± 2.4
Fish products	3.9 ± 2.9	3.6 ± 3.2	4.0 ± 2.8
Eggs	3.9 ± 2.6	4.0 ± 3.2	3.9 ± 2.5
Fruits	13.5 ± 7.9	$11.7 \pm 7.9^*$	$14.0 \pm 7.9^*$
Vegetables	4.9 ± 5.1	4.3 ± 4.7^o	5.1 ± 5.3^o
Legumes	2.8 ± 2.1	2.9 ± 2.0	2.8 ± 2.2
Pasta	0.7 ± 1.2	0.9 ± 1.5	0.6 ± 1.1
Rice	0.6 ± 1.2	0.7 ± 1.3	0.6 ± 1.2
Bread	11.8 ± 7.1	$13.8 \pm 7.3^*$	$11.3 \pm 6.9^*$
Breakfast cereals	0.6 ± 1.9	0.7 ± 1.9	0.6 ± 1.9
Sweets	4.2 ± 4.3	4.3 ± 4.5	4.2 ± 4.3
Fats and oils	7.6 ± 6.9	7.5 ± 9.6	7.7 ± 6.1
Non alcoholic beverages	12.2 ± 13	10.9 ± 11.6	12.7 ± 13.1
Alcoholic beverages	1.6 ± 2.6	$2.4 \pm 3.6^*$	$1.4 \pm 2.2^*$
Snacks	1.6 ± 2.6	1.6 ± 2.7	1.6 ± 2.6

^o $p < 0.1$; * $p < 0.05$ Significant difference between sexes (Student's *t*-test when normally distributed, or the Mann-Whitney test when not).

Multiple regression analysis showed no differences existed in the type of concern expressed with respect to sex or BMI. However, differences did appear with respect to age. As age increased the number of subjects recording no worries decreased: 28.2 % of those under 21 years of age compared to 18.3 % of those older. A clear increase was seen in concern over the content of vitamins and minerals in the diet: 12.1 % in subjects under 21 and 21.3 % in those older (Table 3).

Increasing BMI was accompanied by an increase in the consumption of vegetables and a decrease in the consumption of sausages, pasta, rice, fats and snacks (Table 4). Also, as age increased so did the consumption

Table 3 Concerns about nutrition (%)

	Total	Males	Females
Vitamins and minerals A	18.2	16.1	18.6
Weight control	24.5	25.0	24.1
Fat and cholesterol	35.4	37.5	35.2
Salt intake	0.4	0	0.5
Without concerns A	21.6	21.4	21.7
No answer/No opinion	0.2	0.9	0

A: Significant influence of age (multiple regression analysis).

Table 4 Differences in Food Consumption Frequency (times/week) with respect to concern expressed ($X \pm SD$)

		Concern about vitamins and minerals	Concern about weight control	Concern about fat and cholesterol	Without concerns
Milk	A	13.9 \pm 7.0	13.5 \pm 7.1	13.7 \pm 8.2	13.6 \pm 7.2
Cheese	C	2.3 \pm 3.9	2.4 \pm 5.2	1.7 \pm 3.5	1.7 \pm 3.9
Yoghurt		1.9 \pm 3.2	2.3 \pm 4.6	1.7 \pm 3.3	1.4 \pm 2.7
Meat products	S	6.2 \pm 3.2	5.8 \pm 3.4	5.7 \pm 3.5	6.5 \pm 3.5
Sausages	C, S, BMI	2.1 \pm 3.0	1.5 \pm 2.6	1.3 \pm 2.3	1.2 \pm 2.2
Fish products	S	4.0 \pm 2.4	3.5 \pm 2.6	4.2 \pm 3.2	4.0 \pm 3.0
Eggs		3.7 \pm 2.1	4.1 \pm 2.9	4.0 \pm 2.7	3.7 \pm 2.4
Fruits	S	13.6 \pm 8.7	14.1 \pm 9.2	13.2 \pm 7.3	13.3 \pm 6.9
Vegetables	S, BMI	4.9 \pm 5.6	4.5 \pm 4.3	4.9 \pm 4.8	5.5 \pm 6.2
Legumes		2.9 \pm 2.0	2.4 \pm 2.1	3.1 \pm 2.3	2.9 \pm 2.0
Pasta	S, BMI	1.0 \pm 1.5	0.6 \pm 1.0	0.6 \pm 1.1	0.6 \pm 1.2
Rice	C, S, BMI	0.9 \pm 1.8	0.6 \pm 1.2	0.5 \pm 1.0	0.5 \pm 1.0
Bread	S	12.1 \pm 7.0	10.9 \pm 6.8	11.8 \pm 7.2	12.4 \pm 7.4
Breakfast cereals		1.0 \pm 2.6	0.7 \pm 1.9	0.5 \pm 1.8	0.5 \pm 1.5
Sweets		4.2 \pm 4.5	3.7 \pm 4.0	4.3 \pm 3.9	4.8 \pm 4.9
Fats and oils	BMI	7.4 \pm 6.0	6.9 \pm 5.8	7.8 \pm 7.6	8.3 \pm 7.7
Non alcoholic beverages		10.6 \pm 10.6	12.6 \pm 12.1	12.4 \pm 13.2	12.8 \pm 14.3
Alcoholic beverages	S	1.3 \pm 1.7	1.5 \pm 2.0	1.9 \pm 3.5	1.4 \pm 1.8
Snacks	A, BMI	1.4 \pm 2.3	1.6 \pm 2.6	1.6 \pm 2.7	1.7 \pm 2.8

Significant influence of age (A), body mass index (BMI), concerns expressed (C) and sex (S) (multiple regression analysis).

of milk, accompanied by a fall in the consumption of snacks (subjects under 21 took milk 12.8 ± 6.5 times/week and snacks 1.9 ± 2.6 times/week whilst older subjects took milk 14.2 ± 7.7 times/week and snacks 1.4 ± 2.5 times/week) (Table 4). In a few cases a relationship was found to exist between concern about nutrition and food habits (the intake of cheese, cured meats and rice) (Table 4).

Concern over bodyweight increased with BMI. Subjects expressing this concern (CB) showed greater BMI (21.6 ± 2.5 kg/m²) than those not concerned (NCB) (20.8 ± 2.4 kg/m²) ($p < 0.05$). 11 % of CB subjects and only 5.2 % of NCB subjects were overweight (BMI > 25 kg/m²) (9).

Those concerned about their weight or fat and cholesterol content of their diets consumed skimmed and semi-skimmed milk products more frequently than those expressing no concern in these areas. However, this difference was not significant. The types of milk products consumed were influenced more by sex and BMI (Table 5).

The sports most commonly practiced by the study subjects were football, "home exercises", basketball and cycling. No differences were observed, either in the type of sport played or the time employed in this activity, with respect to the degree of concern expressed (Table 5).

The concerns expressed by subjects showed a stronger relationship with the consumption of supplements and slimming products than with modifications of the diet. Those concerned about vitamin and mineral content took greater quantities of supplements than did other subjects. Those concerned about their weight consumed more slimming aid products (Table 5).

Discussion

The anthropometric characteristics of the studied population are similar to those reported for other groups of Spanish university students (7, 25, 26).

When comparing subjects' dietary habits to those recommended for a varied and balanced diet (32, 33), it is seen that meat products are consumed with quite high frequency (8.3 times per week, combining meat products and sausages). This tendency is characteristic of developed countries (16) and has been observed by Barr (5) in other groups of university students.

The frequencies at which fruits, fish, eggs and milk products were consumed were satisfactory. However, the consumption of cereals and vegetables is very inferior to that recommended (32, 33), a tendency which has also been noticed in other studies (22, 24, 29).

Table 5 Percentage of answers related to the consumption of supplements, type of diet followed and type of milk products consumed with respect to concern expressed (%)

(% of answers)		Concern about vitamins and minerals	Concern about weight control	Concern about fat and cholesterol	Without concerns
Frequency of consumption of vitamin and/or mineral supplements:	C				
– daily		11.2	10.6	4.2	3.5
– occasionally		27.6	25.8	28.4	23.5
– when ill		20.4	9.8	15.3	13.0
– at times of stress		13.3	9.8	11.6	7.0
– rarely/never		24.5	43.9	38.9	53.0
– unknown/no answer		3.1	0	1.6	0
Consumption of slimming aid products:	C	0	9.6	0	0
Practitioner of some sport	S	49.1	53.8	47.1	55.7
Time spent (h/week) ($x \pm SD$)		3.6 ± 6.9	2.2 ± 3.3	1.8 ± 3.2	2.8 ± 4.6
Type of milk products consumed:	S, BMI				
– full		72.4	50.8	63.7	69.6
– semi-skimmed		9.2	15.9	10.5	12.2
– skimmed		16.3	30.3	20.5	13.9
– not taken		2.0	3.0	5.3	4.3
Type of diet followed at time of study:	S, BMI				
– slimming		4.1	24.2	7.9	3.5
– control of cholesterol		1.0	0	2.1	0
– others		2.0	2.3	2.1	1.7

Significant influence of age (A), body mass index (BMI), concerns expressed (C) and sex (S) (multiple regression analysis).

Only 8.6 % of subjects were found to consume the recommended five or more daily servings of fruits and vegetables. In contrast, Serdula et al. (29) found in 16 USA states that 19–23 % of the population took a similar or greater number than the five servings of these foods recommended per day. In the present investigation the mean number of servings was 2.6 per day whilst that found by Serdula et al. (29) was 2.9–3.4 per day.

The consumption of cereals was also found to be lower than that advised. Only 0.4 % took more than the recommended minimum of six servings daily. Within this food group bread was the food consumed with greatest frequency, an observation also described by Farré et al. (7) (Table 2).

With regard to sex, men reported a more frequent consumption of milk, meat products, bread and alcoholic drinks. In contrast, women consumed more salads and fruit. This kind of association between sex and food choice has been well documented in groups of different ages (3, 29, 31) and probably reflects the tendency for

women to show greater interest in diet and health issues. One of the most well known contradictions in nutrition was also observed in the present study: women consumed much less meat and meat products than did men, even though they need more iron than men (17).

It could be suggested that rising concern over the quantity of vitamins and minerals in the diet, observed as subjects became older, could be conditioned by the greater knowledge possessed by such subjects.

Some authors (18) point out that among young people one of the main worries related to nutrition is weight control. In the present experimental group, although 24.5 % showed concern about this, the main concern expressed was that of fat and cholesterol content of the diet. The same has been previously reported by Loughry et al. (14).

Over the past decade a large number of organizations, particularly in Western industrialized countries, have established links between diet and the incidence of chronic diseases such as heart disease, high blood pressure and

cancer. Many documents have been circulated explaining these relationships (32, 33). All of these reports recommend maintaining an appropriate body weight, limiting fat, cholesterol, sodium and sugar intake, increasing complex carbohydrate and fibre intake through increased consumption of fruits, vegetables and grain products and consuming alcohol only in moderation.

As reported by other authors (35) it is observed here that some messages have had a greater impact on the population than have others. Whilst the control of bodyweight, fat and cholesterol content of the diet and the intake of vitamins and minerals are areas that worry a large percentage of the population, the control of sodium or sugar intake, increasing the intake of complex carbohydrates and fibre through the consumption of vegetables and grain products, or the consumption of moderate quantities of alcohol hardly worry the experimental population at all.

Since the early 1980s, the general public's awareness of, and interest in, nutrition and health has increased (6, 34). However, consumer knowledge of specific nutrients, and how specific dietary practices are related to health, have not increased accordingly, nor do food choices necessarily correspond to nutrition knowledge (6, 19, 28, 34). It is peculiar, therefore, that even though fat and cholesterol intake are reasons for concern in theory, foodstuffs like meat and eggs are consumed by the studied population in quite large quantities.

Men were more often overweight than women (24.3 % of men, compared to 1.6 % of women had BMI > 25 kg/m²). However, men were less worried about their weight than were women. There are many studies which show that for many years women have been more likely to engage in dieting behaviour than men. They also have leaner standards of desired weight, have more knowledge of weight-loss methods and nutrition, and more motivational barriers to weight control (8).

As described by other authors (11), concern over bodyweight increased with BMI. However, amongst those who wanted to lose weight, 42.2 % of women and 7.4 % of men had a BMI < 20 kg/m². These persons, already very slim (below recommended values) still wished to lose weight and could become susceptible to nutritional imbalances or ill health if they were to continue with such an obsession to be slim (20).

The media may have played an important role in the concerns expressed by subjects. They are frequently cited as sources where adults seek nutrition information (5, 7). Hickman et al. (10), who analyzed the messages in several women's magazines, observed that the percentage of

advertisements with at least one claim referring to body weight and/or calories increased from 3.6 % in 1975, to 11.1 % in 1982, and 17.3 % in 1990. The use of nutrition claims that focused on the absence of specific dietary substances (e.g., fat, cholesterol) increased from 20.2 % in 1975, to 30 % in 1982, and 45.8 % in 1990, a trend also noted by Barr (5). This tendency has also been reported in analysis of publicity in Spain (21, 23) and could condition the concern expressed by the studied population.

In this population it can be seen that there are few relationships between concerns and habits: worry in a particular area is not associated with habits that would reduce reasons for concern. However, there is a clear relationship between concern over vitamin and mineral content of the diet and consumption of supplements, and also between bodyweight and consumption of slimming aid products.

The American Dietetic Association (2) indicates that the lack of relationship between knowledge of nutrition and habits may be due to the general public's understanding about the role of diet in health being superficial. However, given that the experimental population is probably more informed in this area, another explanation for the observed lack of relationship between concerns expressed and food habits could be that at least some subjects know their errors and record them as reasons for concern, yet lack the will necessary to correct their behavior.

The experimental population is composed of university students whose courses include nutrition. The subjects are well educated and probably show concern or interest in matters related to nutrition. This type of background may help individuals acquire more healthy food habits (17, 29, 31). However, knowledge about subjects' mistaken beliefs could help better design nutrition education campaigns which seek to improve the nutritional status of this population.

Dietary studies conducted in colleges and universities suggest that food habits may change during one's student years (1). Additionally, a positive response to nutritional education, with changes towards a low fat, high fibre diet have been reported among students (13).

The work of Hickman et al. (10) showed that many of the publicity messages appearing in women's magazines use concern about nutrition to promote sales. The population's worries, already used by publicity agencies, should perhaps be recognized and studied by nutrition educators so that they might better design their messages and improve education programs.

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