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Evaluation of Eating Habits among Portuguese University Students: A Preliminary Study

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***Abstract*—**Portuguese diet has been gradually diverging from the basic principles of healthy eating, leading to an unbalanced dietary pattern which, associated with increasing sedentary lifestyle, has a negative impact on public health. The main objective of this work was to characterize the dietary habits of university students in Viseu, Portugal. The study consisted of a sample of 80 university students, aged between 18 and 28 years. Anthropometric data (weight (kg) and height (m)) were collected and Body Mass Index (BMI) was calculated. The dietary habits were assessed through a three-day food record and the software Medpoint was used to convert food into energy and nutrients. The results showed that students present a normal body mass index. Female university students made a higher number of daily meals than male students, and these last skipped breakfast more frequently. The values of average daily intake of energy, macronutrients and calcium were higher in males. The food pattern was characterized by a predominant consumption of meat, cereal, fats and sugar. Dietary intake of dairy products, fruits, vegetables and legumes does not meet the recommendations, revealing inadequate food habits such as hypoglycemic, hyperprotein and hyperlipidemic diet. Our findings suggest that preventive interventions should be focus in promoting healthy eating habits and physical activity in adulthood.

***Keywords*—**Food habits, BMI, fortified foods, nutritional deficiencies, university students.

I. Introduction

CHANGES in lifestyles of populations observed in recent decades have led to a decrease in the time to acquire, hold and cook family meals leading to options for pre-cooked meals and fast food [1].

Also in Portugal there has been a progressive loss of most of the standard features of traditional food in favor of adopting the Western dietary pattern. An excessive consumption of energy is observed, associated with various unhealthy patterns: increased consumption of fats rich in saturated fatty acids and cholesterol; decreased intake of foods rich in complex carbohydrates and increased consumption of simple carbohydrates; poor and irregular use of horticultural products; growing consumption of meat, dairy products, hydrogenated oils and fats, ready to eat products, alcoholic and sweetened beverages; and finally a decreasing consumption of bread [2].

Early adulthood constitutes an age where there is a prevalence of not adequate eating habits, having in mind that entry to university represents a period of more responsibility in regards to housing, financial management and in particular the food choices and practice of healthy lifestyles [3]. The lack of time and desire, a stressful lifestyle, the situations generated by the academic media, peer socialization and easy access to pre-prepared foods and fast food constitute pivotal aspects that influence eating behaviors of these young [4].

This work was mainly focused on the characterization of the eating habits of a sample of university students in Viseu, Portugal, in order to assess the need for the consumption of fortified foods as a complement to their diets. Specifically it was aimed to:

- assess the caloric intake and macro and micronutrients from the sample of university students;
- determine the anthropometric profile of the sample population;
- compare and identify differences in consumption of major nutrients among young female and male;
- compare the values of nutritional intake of the analyzed sample with the values reported in the literature and the food wheel.

II. Experimental Procedure

A. Sample

The population in this study consisted of a total of 80 university students of both sexes aged between 18 and 28 years.

Pregnant women were excluded on the basis because a BMI over 25kg/m^2 for a pregnant woman might not indicate overweight or obesity. Individuals younger than 18 years of age were also excluded because BMIs of adolescents are not comparable to BMIs of adults due to rapid changes in height during adolescence.

Data were collected between October 2010 and July 2011. Participation in the study was voluntary and anonymous. Students were informed that by completing the questionnaire they were providing their informed consent to participate.

B. Food Record

Participants completed 3-day food record. The dietary records were recorded over three days including two weekdays

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and one weekend day, excluding Friday. Specifically, records were kept Wednesday, Thursday and Saturday, or Sunday, Monday and Tuesday. Participants were asked to record estimated portions of all food and to include brand names of items when possible, to indicate which foods were consumed in restaurants and which were prepared at home, and were queried about the relative amounts of ingredients in all combinations foods (pizza, etc) [5].

C.Anthropometric Evaluation

Height was measured using a stadiometer. Body weight was measured with a dual-beam balance scale. Weights were obtained without shoes in light clothing. Body Mass Index (BMI) was calculated from measured height and weight as kg/m [6].

D.Evaluation of Food Consumption

After collecting the questionnaires, the amounts of food and beverages described in household measures were transformed into grams or milliliters with the help of the Manual for Quantification of Foods from the Faculty of Food Nutrition and Food Sciences, University of Porto (FCNAUP) [7].

To convert food into nutrients in order to obtain the estimated average daily intake of individuals was used the software Medpoint, based on the Food Composition Table of the National Health Institute Dr. Ricardo Jorge IP (INSA I.P.). Subsequently, the mean of the three days of recording was calculated, and the daily energy, macronutrients (proteins, carbohydrates, lipids) and calcium intakes were evaluated.

In order to estimate the proportion of each food group in the diet of young university students, the foods belonging to the same category were grouped and it was determined the caloric value of that group. Later, taking into account the average total caloric intake, the percentage of the different food groups was calculated.

Regarding the distribution of meals, were accounted the meals taken by the students during the study period as well as the number of times that the breakfast was present in the diet of these young people.

E.Adequacy of Energy and Nutrients Ingestion

To estimate the total energy expenditure (EER) the predictive equations for the total energy spent in the different stages of life proposed by Health Canada were used [8]:The physical activity coefficient values of 1.12 and 1.11 were considered, respectively for females and males, which represent a moderate level of physical activity, contemplating activities of daily living and also 30-60 minutes of moderate physical activity per day [8].

The prevalence of inadequacy of macronutrients was analysed based on the values of the estimated average requirements (EAR). The relative distribution of macronutrients in relation to total energy value (TEV) was also evaluated, using as reference the values of acceptable macronutrients distribution range (AMDR) indicated in Table I.

TABLE I
ENERGY DISTRIBUTION BY MACRONUTRIENTS AS A PERCENTAGE OF THE TOTAL ENERGY VALUE (TEI)

Macronutrients Recommendation (% of TEV)	**According to WHO** [6]
Carbohydrates	55 – 75
Lipids	15 – 30
Proteins	10– 15

F.Statistical Analysis

The data collected were analyzed using the software "Statistical Package for the Social Sciences" (SPSS), version 20.0, 2011. The numerical results are presented as mean ± standard error.

To compare the means of the variables by gender the Student-t test for independent samples was used. The comparison of consumed portions of different food groups with those recommended by the Portuguese food wheel was done by one sample t-test. The significance level was set at 5% ($p \leq 0.05$).

III.RESULTS AND DISCUSSION

A.Sample Characterization

In this study were evaluated 80 healthy persons from a group consisting of young people frequenting higher education. The sample consisted of 48 females (60%) and 32 males (40%).

The age of the enquired ranged between 18 and 28 years, with an average of 22.50 ± 2.24 years for females and 22.13 ± 3.18 years for males, being these means not statistically different.

B.Anthropometric Characterization

Table II presents a characterization of the sample as a function of weight, height and BMI. Analyzing the data in Table II for weight, height and BMI, it is concluded that the average values for females are significantly lower than for males.

It was further observed that the totality of the female population and 75% of the male population were normal weight, with a BMI between 20.64kg/m^2 and 24.36kg/m^2.

TABLE II
ANTHROPOMETRIC CHARACTERISTICS OF THE SAMPLE ACCORDING TO GENDER

Anthropometric measures	Male	Female	P[1]
Weight (kg)	73.75 ± 0.96	56.08 ± 0.71	< 0.005
Height (m)	1.74 ± 0.01	1.65 ± 0.01	< 0.005
BMI (kg/m^2)	24.36 ± 0.34	20.64 ± 0.22	< 0.005

[1]P value for the comparison between male and female

C.Eating Habits

The results of the study revealed that the number of meals per day varied between 3 and 5. The frequency of meals showed differences among the male and female populations. Thus, 50.0% of male respondents eat four meals per day, while 37.5% eat only three meals and a reduced percentage, 12.5%, eat five meals daily. For the female population, 58.3% have

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five meals a day against 41.7% which have four meals.

All students surveyed have at least two meals per day at home. Half the population of both sexes has the remaining meals in canteens, restaurants or snack bars. It was further observed that 25.0% of males and 33.3% females consumed fast food, at least once, during the study period.

The food records showed that over the three days 66.6% of female and 37.5% male respondents always took breakfast, and this meal is mostly done at home. It should also be noted that 25.0% of men surveyed reported never to take breakfast.

Table III shows the values of the average daily intake of energy and macronutrients, by gender. Evaluating the caloric ingestion, it was found that the two groups had different mean values, being the average energy intake among the female population significantly lower than in the male population (2113.8 ± 60.5 kcal vs. 2430.4 ± 85.5 kcal) ($p = 0.003$). As shown by the analysis of Table III, the male students also showed intakes of carbohydrates and proteins statistically greater than females. With regards to the ingestion of lipids, although showing a higher average value for males, no statistically significant differences were encountered among genders.

TABLE III
COMPARISON OF THE AVERAGE DAILY INTAKE OF ENERGY NUTRIENTS BY GENDER

Daily intake	Male	Female	P[1]
Energy (kcal)	2430.4 ± 85.5	2113.8 ± 60.5	< 0.005
Carbohydrates (g)	248.8 ± 9.5	251.5 ± 7.0	< 0.005
Lipids (g)	87.8 ± 4.7	79.0 ± 4.0	< 0.005
Proteins (g)	121.3 ± 3.8	96.2 ± 3.1	< 0.005

[1]P value for the comparison between male and female

When evaluating the distribution of the total energy in macronutrients, it was observed that the consumption pattern is similar in males and females.

Analysing the foods eaten by these college students, it was found that 100% the male students vs. 66.7% of females exhibited carbohydrate intakes below the recommended levels (55-75% of total daily energy) [9].

The observation of the ingestion of lipids shows that 58.3% of female students vs. 62.5% of males ingested a quantity above the recommended values (15-30% of total energy intake) (Fig. 1). Based on the foods consumed by the students, the lipids consumed in greater quantities are olive oil, vegetable oils and vegetable cream spread, being just a small part related to meats, fries and some sweet pastries (cookies or cakes).

Most of the population in the study also presented a hyperproteic diet, with only 8.3% of the female population showing values within the limits recommended by the DRI (10-15% of total energy intake) (Fig. 1). The analysis of the food records showed that these high levels of protein intake are the result of a diet dominated by the intake of red meat and lacking white meats and fish, dairy products and legumes.

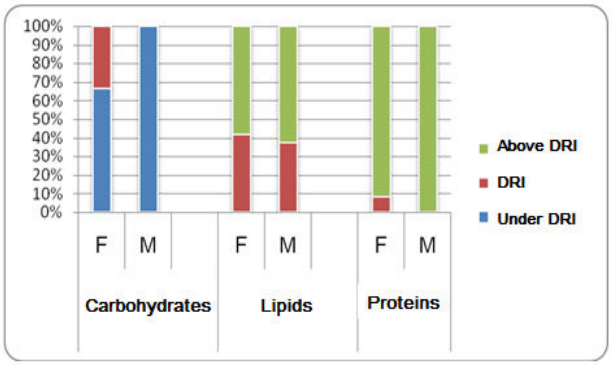


Fig. 1 Proportion of macronutrient intakes (average percentage contribution to the total daily caloric intake), in accordance with the acceptable ranges recommended by the WHO for both sexes

D.Eating Quantities and the Food Wheel

Given the proportions of the different food groups recommended by the new food wheel proposed by Rodrigues et al. [10] and shown in Fig. 2, it was found that the proportion of cereals and derivatives in the daily diet of young students of both sexes was higher (39.3% for males and 42.5% for females) than the recommended amount (28%), being the differences between genders statistically significant ($p = 0.040$) (Fig. 3). Within the sample studied, it was reported, for both sexes, a daily consumption of rice, white bread, pasta and potatoes. The crisps, biscuits of the type Maria or integral cookies and cereals flakes were consumed less frequently.

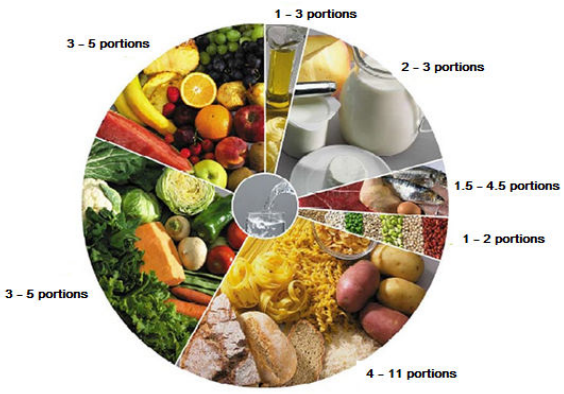


Fig. 2 New food wheel according to Rodrigues et al. [10]

The pastries (scones, croissants and cakes) were consumed in at least one day of the study by the majority of respondents of both sexes. It was also indicated by most students the intake of sugar and jam, at least once a day.

The consumption of vegetables in the diet is scarce among these young, both female and male (1.0% and 1.5%, respectively), consuming less than 5 servings per day (Fig. 3). The majority of respondents consumed these products scarcely during the three days of registration, only on one day or even never.

The average consumption of fruits shows no statistically significant differences between sexes (2.1% for males and

1.9% for females) and is less than the amount recommended by the Food Wheel (20%). Indeed, it appears that the majority of students do not consume fruits daily.

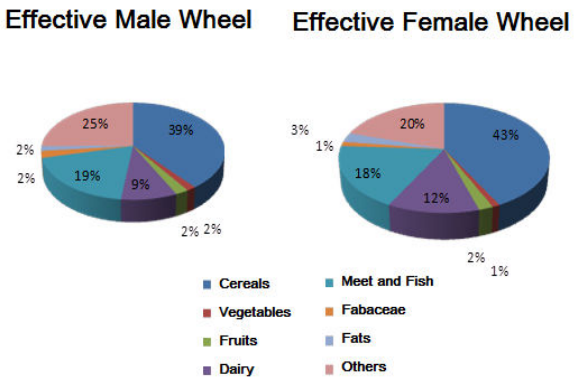


Fig. 3 Percentage of different groups of the Food Wheel in the diet of the higher education students

In the case of dairy products, it can be seen that the average consumption of dairy products is higher in females (12.1%) compared to males (8.9%) (Fig. 3), although this difference not significant ($p = 0.021$). There also should be noted that only four young females and four males showed a consumption of dairy products (21.6% and 20.1%, respectively) higher than the recommended 18% of the Food Wheel. In the group of dairy products, semi-skimmed milk and yogurts, either solid or liquid, are the foods ingested most frequently by both sexes and are consumed once to three times per day. The cheese is not so often included in the diets of young people.

For the group of meat, fish and eggs was observed a very high consumption (19.1% male and 18.4% female) compared to the amount recommended by the Food Wheel (5%), with no significant differences between sexes (Fig. 3). In the diets evaluated it was found that there is a greater consumption of meat products in disfavor of fish products. Eggs are virtually nonexistent or consumed in very small quantities by these young people.

Regarding fabaceae (beens, peas, etc…) consumption were observed significant differences between genders ($p = 0.047$), with a greater percentage of these foods in the male population (2.3% vs. 1.3%) (Fig. 3).

Finally, with respect to the group of fats and oils, the overall average consumption of these products in both sexes is greater than the amount recommended by the Food wheel (2%). It is visible a significant difference between genders ($p=0.000$), with increased consumption by the female population (2.8%) compared to males (1.6%).

The young respondents never refer to alcohol consumption and 45% of the enquired drink water every day. The consumption of soft drinks in addition to water is mentioned by 25% of young males and 16.7% females. Both the coffee and green tea were consumed only by a minority of the population.

IV. Conclusions

Poor nutritional behavior is associated with many risks that endanger health not only during later life but also during early adulthood. Despite the high level of the education of university students, they still have poor nutritional habits, more so than the general population.

In the present study, most college students are normal weight, with only 10% of overweight males (BMI greater than 25kg/m^2) (data not show).These results are in accordance with others [1] which reported that obesity was more common among male students than females. This was expected because females are more cautious about their weight status than males due to society perceptions, which encourages females to be slender.

As to the average contribution to the total energy derived from carbohydrates, values are lower than those recommended in the literature. However, the level of lipid and protein intakes exceed the recommended values, with the majority of the university population studied presenting a hyperlipidic, hyperproteic and hypoglucidic diet. This contribution comes from cereals and their derivatives, fish and meats as well as fats and oils. On the contrary, the ingestion of foods from the groups of vegetables, fruits, legumes and dairy products is clearly lower than the recommended dosages.

The analysis showed that these college students have inadequate eating habits, including a low number of daily meals, frequently omitting breakfast, having excessive caloric intake, practicing a slight varied diet, predominant in fat and protein rich foods, but lacking fruits, vegetables, legumes and dairy products. It was also observed that the food intake of these young people does not meet neither the recommendations of the daily energy needs nor the different food groups requirements.

Despite the fact that this is a preliminary study it is worth mentioning that these results may not be indicative of the overall student population, considering that the analyzed sample was relatively small. In this way, a further study should be implemented with an increased number of people surveyed, in order to get a more representative sample.

In conclusion, lifestyle modification is important, especially in young age groups to improve healthy habits earlier in life. The University represents the opportunity for nutritional education of a large number of students. Our findings suggest that preventive interventions should be focus in promoting healthy eating habits and physical activity in adulthood.

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