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Nutritional evaluation of urban students from a public university in Mexico

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ABSTRACT

The diet of University students has been modified by the influence of technology, fast food and social conditions. The goal of this study was to evaluate overweight, obesity and the socioeconomic conditions of students in a public University in Puebla, Mexico by measuring the body mass index (BMI), Harris-Benedict, 72 hours reminder and socioeconomic markers (CONAPO). Of the 76 university students who volunteer, 21.05% of them had overweight and 9.21% presented obesity. The student population presented a medium socioeconomic level and a low marginality index.

Key words: Nutritional state, marginality index, urban population.

INTRODUCTION

The feeding behavior in the Mexican population is established since adolescence, when environmental, family, cultural and social conditions have a great influence on its definition [7,24]. The most common eating problems among youth might conduct to disorders such as bulimia, anorexia, malnutrition, overweight and obesity; these disorders may be caused by sedentary, lifestyle changes, strict school schedules and extra academic activities [7,23,29]. The Mexican population has numerous and varied dietary patterns that have been divided into marginal diet (only rural population 30%); working class diet (in which the majority are urban, 50% of the country), middle class and upper class diet (only urban population, 20%) [7].

Overweight and obesity in the young population has increased in Mexico since the last national poll of health and nutrition in 2006, which constitutes a risk to health due to the potential development of chronic degenerative diseases and tooth decay [19]. Socioeconomic aspects strongly influence the eating behavior [21]. It has been observed that the socioeconomic level determines the intake patterns resulting in healthy habits or an unbalanced intake [15].

A nutritional valuation is that which evaluates the correct growth and development, somatic, psychological and social, avoiding deficiency states. The nutritional needs vary in function of the development stage and the genetic and metabolic differences in each individual [1,26]. A good nutrition helps prevent diseases and to develop physical and mental potential. Hence the importance of an adequate diet and nutrition at the stage of university studies since it is a period of life in which people generate greater productivity from the economic and social point of view [25,30]. Evaluation of the nutritional state it's been used as an indicator of the health state and in the location of risk groups for deficiencies and excesses, which can be a risk factor in many of the most prevalent chronic diseases nowadays [2,16].

The university stage is a very important biophysical social process in which an inadequate diet may affect the performance and intellectual capacity of individuals, this may be of special relevance to life quality in developing countries, where its habitants face adverse socioeconomic, cultural and nutritional conditions [4]. In the other hand, in this university stage one can acquire eating habits, dietary models and physical activities that predispose to risk factors for food transmitted diseases and chronic degenerative diseases.

The pressure of advertisement, bad programmed slimming regimes in order to adapt to a prevailing beauty regime, irregular eating schedules, etc. may become nutritional risk factors. All of this makes this segment of the population an especially vulnerable group from the nutritional point of view [16]. Nowadays, not only the malnutrition indexes are a concern but also the weight increment and the obesity in university students. Obesity has been included among chronic diseases associated to inadequate lifestyles as an indicator of poverty [20]. The consequences of exogenous obesity (obesity induced by sedentarism and bad eating habits) are a risk factor that entails to degenerative chronic diseases like diabetes mellitus, high blood pressure, cardiopathies and infectious diseases [5,19,26]. The increment in these eating problems during the last years has awakened the interest of several researchers to determine the main factors in the adquisition of eating problems [18].

Evaluation of the nutritional state through anthropometric techniques allows us to give a current view and at the same time take preventive measures among the youth [17]. The body composition is assessed mainly by the body weight, height, body mass index (BMI) and body surface area [8]. The goal of this study was to estimate the tendency to overweight and obesity on an urban university population, using anthropometry, caloric intake and socioeconomic markers (CONAPO).

MATERIALS AND METHODS

A transversal descriptive study was performed on a population of 76 university students who volunteered (56 women and 20 men) between the ages of 21 to 28 from a urban public university. The study was conducted to students of tenth semester pharmaco chemical degree. The participants gave their informed consent.

Dietary intake assessment. The caloric intake (CI). A questionnaire was used for the 72 hour reminder applied by trained staff, the information gathered was processed with the Rsigma Babel software (Horus Hardware, Madrid, 1991). Total energy expenditure (TEE). It was calculated with the Harris-Benedict (1919) equation.

Anthropometry. Weight (kg) and height (cm) were registered and the BMI was calculated ($BMI = \text{weight} / \text{height}^2$). The weight measurement was done with light clothes, on an empty stomach, at the same hour and at adequate temperature using a scale with 0.1kg of precision (Tanita® BF681W). Height was measured with the subject barefooted, using a stadiometer with a 1mm precision (Holtain Ltd.). The BMI was interpreted using the low weight, normal weight, overweight and obesity classification established by the OMS. Moreover, the body size was determined three times, measuring the width of the elbow and reporting the arithmetic average.

Socioeconomic markers. The variables upon the socioeconomic factors were obtained from a survey that estimated the average monthly spending, type of transportation, tobacco, alcohol and fast food intake. The marginal index for this population was taken from the CONAPO.

Statistical analysis. The statistical analysis was done using Statgraphics plus 4.1. The results are presented as averages, maximums, standard deviation, minimums, frequencies and variance analysis [27]. The level of statistical significance used was $p < 0.05$, the total sample was stratified according to sex and BMI.

RESULTS

Tabla I. General characteristics of the sample (mean $\pm$ SD)

TABLA 1					
GENERAL INFORMATION					
	Reference Value	Total (n=76)	Male (n=20)	Female (n=56)	P NSD
Age		22.96 $\pm$ 1.65	23.7 $\pm$ 2.20	22.69 $\pm$ 1.33	<0.001
Weight (kg)		61.52 $\pm$ 11.80	70.64 $\pm$ 9.53	58.33 $\pm$ 10.86	<0.001
Size (cm)		158.14 $\pm$ 19.85	170.37 $\pm$ 6.39	156.58 $\pm$ 4.60	<0.001
BMI (kg/m ²)		23.76 $\pm$ 3.80	24.13 $\pm$ 3.20	23.62 $\pm$ 3.19	<0.001
Low Weight (%) ^a	BHI<18.5	1.3	0	1.8	<0.001
Normal Weight (%) ^a	BHI 18.5-24.9	68.44	65	69.6	<0.001
Overweight (%) ^a	BHI 25-29.9	21.05	30	17.9	<0.001
Obesity (%) ^a	BHI >30	9.21	5	10.7	<0.001
TEE ^a		2393.32 $\pm$ 338.28	2829.72 $\pm$ 247.29	2237.46 $\pm$ 202.33	<0.001
CI ^a		2459.60 $\pm$ 476.81	2973.79 $\pm$ 525.55	2275.96 $\pm$ 288.78	<0.001

*WHO, 2010, Body Mass Index (BMI), Standard Deviation (SD), No Significant Difference (NSD), Total Energy Expenditure (TEE), Caloric Intake (CI).

Figure 1 shows the prevalence of the nutritional state by gender in the study population. It was found overweight in 30% of the males and in 18% of the females. As for the obesity percentage, 5% of the males and 11% of the females presented it.

Figure1. Prevalence of nutritional status by gender in the study population

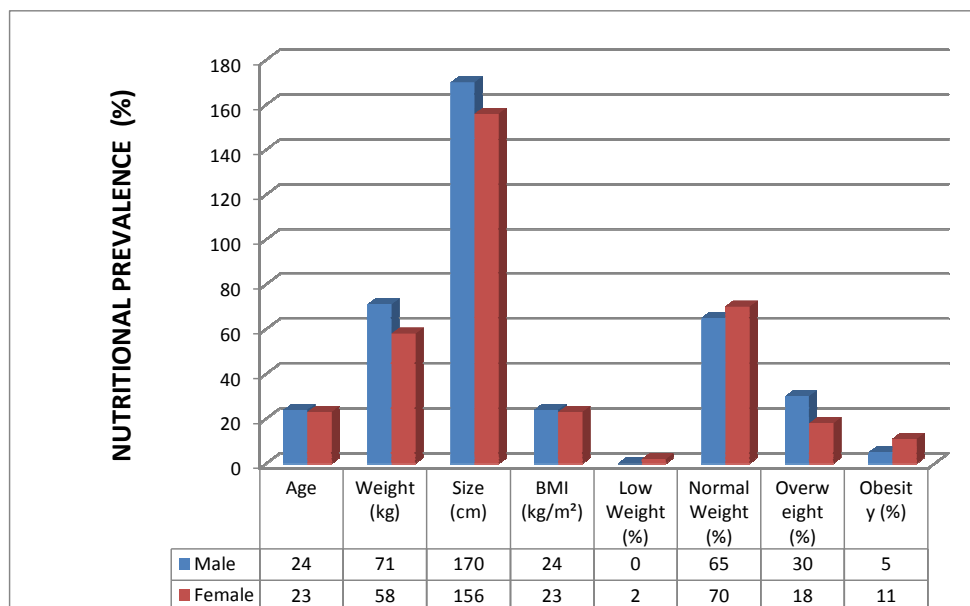


Table number 1 shows the general characteristics of the subjects (age, weight and height), classification according to BMI, TEE, CI and the significance of the differences between gender. The weights of the general population were

between 42 and 95 kg whereas height ranged between 147 and 190 cm. The male population (n=20) was 26.3% and age between 21-28 years old, the total energetic expenditure was of 2,394-3,332 calories, their caloric intake was of 2,003-4,009 calories, body size in the male population was 30% small, 65% medium and 5% big. The volunteered female population (n=56) was 73.7%, ages between 21-27 years old, with a TEE of 1,874-2,734 calories, CI of 1857-2767 calories, body size was 48.2% small, 46.4% medium and 5.4% big.

When we determined the socioeconomic marker, it was found that according to the CONAPO reports, 2007, urban university population in the city of Puebla was within a marginal index of -1.62, which is considered very low, due to the characteristics this population showed. 87% of the students reported an average monthly spend of a minimum wage (136.00 USD), 35% of the student population consumed alcohol, 15% smoked and 78% used the bus as mean of transportation. Detailed results are shown in figure 2. It shows that 92% of the students eat fast food, which is a reflection of modernity and transitory eating habits.

Figure 2. Socioeconomic indicators and features CONAPO for urban student population

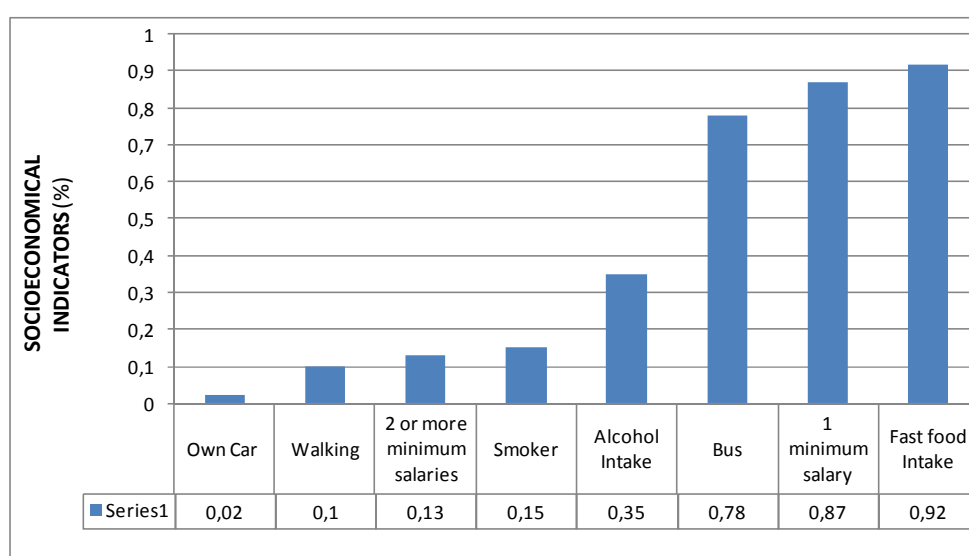
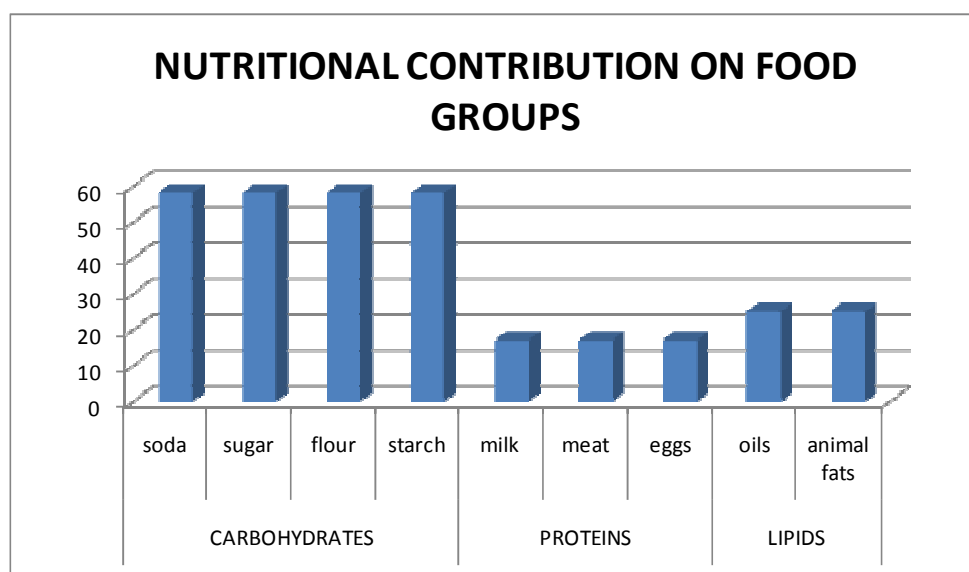


Figure 3. Foodstuffs consumed in the university population



The 72 hour reminder, helped estimate the food that is eaten with frequency by men and women: there was no significant difference between the food preferences of these two groups. There is a big intake of carbohydrates, fats and low protein intake. Within the favorite foods was soda, food prepared with flour, starch and sugar, such as corn based drinks (atoles), cookies and saturated fats in typical food (Figure 3).

DISCUSSION

One of the findings of this study was to detect a population with overweight and obesity in a percentage which is not alarming, nevertheless, the tendency towards eating habits is important, since it has been reported that eating habits are established at young age [7,22]. On the other side, an excess on the intake has become a pandemic in the last years, with contrasts in the American continent [16]. Mexico suffers from a serious eating problem reflected in chronic malnutrition situations, and obesity problems [21] which coincides with the results of this study, in which is reported a prevalence of overweight and obesity both in men and women: women presented a bigger obesity percentage and men a bigger overweight percentage [14].

The results also agree with the reports made by other researchers [16,31]. Moreover, on 2006, it was found that 30% of the Mexican population older than 20 years old showed overweight [11], in this study we found overweight (22 %) and obesity (9.21%), which suggests that modern lifestyles might be related to the behavior that enable these eating disorders risking future generations; [10] characterizes food intake in teenagers from the south of Europe, observing that this population does not usually eat snacks and fast food, but have a high fatty acids intake due to olive oil consumption (about 40% of the energy intake), resulting in a prevalence in overweight/obesity of 15-25%, different from our study in which 9-21% of obesity and overweight are due to the carbohydrates (corn and wheat), saturated fatty acids mainly from animal origin (pig fat) in the diet (Mexican fast food) consumption. There are some studies in Mexico, where it has been detected that 0.9% of men and 2.8% of women at the university stage present high risk of suffering from eating disorders [6] and that this risk has increased from 1997 to 2003, mostly in women [4].

It has been also identified in other states of the Mexican republic such as Morelos, that the prevalence of risky eating behaviors was of 1.1% in men and 5% in women, which coincides with the findings in this study, since we obtained an overweight in the general population of 21.05% from which 30% corresponds to men and 17.9% to women, counter to the general population obesity which had a prevalence of 9.21%, women having 10.7% and men 5%, this due to the excessive energy intake without an established schedule for eating and a big consumption of fast food (92%); since the OMS establishes that in the university stage women must consume 2,200 calories and men 2,900 calories, we observe over caloric consumption according to the analysis from the 72 hours reminder in both groups and in consequence to the tendency towards overweight and obesity. It has been mentioned by some authors the calorie overestimation of the Harris-Benedict formula, but it is still very useful nowadays [25].

In other European countries it has been observed contrasting situations, not finding students with obesity, however, there are individuals with overweight, mostly men, on the other hand, countries like Venezuela present malnutrition in its university population [13,22]. It has been documented that determining the body size using anthropometry is very useful, since there are significant differences between races, and consequently the energy requirements are very variable, this is put in evidence with the results obtained. The university population got in greater percentage a medium body size and according to this, the requirements must be calculated [2,6].

Regarding the different social classes and the urban and rural stratum, significant differences in quality and quantity of the nutrients have been reported; moreover [23] shows how overweight/obesity vary according to socioeconomic status and educational level. Results from [19], suggest that familiar factors, mother's schooling and the socioeconomic state establish the tendency towards obesity and overweight [9]. University student's diet was based primarily on the consumption of corn and bean, but the modernization and development of fast food has caused some adjusting with the increase on refined food intake, rich in energy (high calorie concentration), sugar, saturated fats, cholesterol and low fiber food [12]. This eating way resembles the eating patterns of industrialized countries, while Mexico continuous to be a developing country [28].

The socioeconomic conditions that distinguished the totally urbanized population were low marginal index, which characterizes students with an economic resource of at least a minimum wage, which equals 136.00 USD per month to cover expenses such as food, transportation, alcohol and cigarettes.

Students from a public University in Puebla, Mexico presented a tendency towards overweight and obesity and medium socioeconomic condition which allowed them to eat according to their preference food rich in carbohydrates, fats and low protein

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