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Obesity and cardio-metabolic risk factors in Ecuadorian university students. First report, 2014–2015

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ABSTRACT

Objective: Overweight and obesity are risk factors for developing cardiovascular disease. The objective of this study was to determine the prevalence of obesity and risk factors associated with metabolic syndrome and cardiovascular disease in university students.
Methods: 883 students from the Faculty of Medical Sciences of the Central University of Ecuador were included, who were surveyed with demographic data, smoking habits and physical activity. Body mass index, abdominal circumference and blood pressure were determined. Blood chemistry and lipid profile were performed. Central tendency and dispersion measures, average comparisons (Student's T) and Pearson's correlation were calculated to study quantitative variables and $\chi 2$ distributed statistic for the comparison of qualitative variables.
Results: The prevalence of overweight and obesity was 25.5%. The body mass index was similar in both sexes (23.15 women / 23.57 men), waist circumference was higher in women. Men had higher than normal levels in blood pressure and elevated triglycerides while women had high cholesterol.
Conclusions: One of four students presents some degree of overweight or obesity and an important percentage of altered levels of plasma lipids and blood pressure. Blood glucose levels were found in normal ranges.

1. Introduction

Overweight and obesity occurring at an early age are a serious public health problem because of their association with the risks of developing various chronic non communicable diseases that have been the leading causes of death in developed and developing countries [1,2]. Obesity is considered a major risk factor for cardiovascular disease (CVD) and diabetes mellitus type 2 (DM2) and is associated with hyperinsulinemia, insulin resistance, glucose intolerance, arterial hypertension and metabolic syndrome (MS) [3,4]. Individuals with obesity (especially abdominal) have a lipid profile known as atherogenic dyslipidemia, which is characterized by increased triglyceride, low-density lipoprotein (LDL), decreased levels of high-density lipoprotein (HDL) [5], and is associated with MS, DM2 and CVD. They also present a decrease of the physical activity that is a risk factor that is reflected by the commitment in the capacity of metabolization of fats and glucose by the muscle deriving in the development of chronic metabolic and cardiovascular pathologies.

Several studies have analyzed these risk factors especially in adulthood [6], to a lesser extent in the infant and adolescent population [7,8], but very few have done so in young people in early adulthood (17–25 years) [9,10], which is characterized by a series of changes that may affect life habits, especially hygienic-diet and physical activity, previously acquired in childhood [11]. Data collected in the United States show that in this age range there is an increase of the risks of having unhealthy diets, decreased physical activity and development of obesity [12,13], which can be aggravated in university students who carry a style of life characterized by stress and time loads that lead to the consumption of fast foods that are not very nutritious, irregular feeding schedules and lack of time for physical exercise, which makes them susceptible to develop obesity and its complications [14,15].

Sedentary behaviors and eating habits are associated with overweight and obesity among the young [16], leading to a higher morbidity and mortality [17]. In Ecuador, according to data published in the National Health and Nutrition Survey Ecuador

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(ENSANUT-ECU 2011-2013), the prevalence of overweight and obesity at a national level in adolescents aged 12–19 years is 26%, while in those older than 19 is 62.8% being greater in women (65.5%) than in men (60%) [18].

Other researchers found a prevalence of overweight and obesity of 13.7% and 7.5%, respectively [19]. Some authors attribute these percentages of overweight and obesity to the lack of physical activity, which is becoming more frequent at an early age. Physical activity is inversely associated with different metabolic indicators such as lipid profile, insulin resistance and arterial hypertension. However, physical activity must meet certain conditions at the time of its performance (type, intensity, frequency and duration) to become effective [20].

The present study investigates the prevalence of obesity and its association with lipid abnormalities and other risk factors associated with MS and CVD (hypertension, DM2, smoking and physical inactivity) among university students between 17 and 25 years of age at the Faculty of Medical Sciences of the Universidad Central del Ecuador (UCE).

2. Material and methods

This is an epidemiological, descriptive, cross-sectional study in which risk factors correlated with the prevalence of obesity were determined. Students of first, second and third semester of UCE were included prior informed consent. The study was approved by the Ethics Committee of the Faculty of Medical Sciences. Students answered a survey on demographic data, smoking habits and exercise practice and it was run from October 2014 to March 2015.

Weight and height were determined using a calibrated height scale (SECA brand), the students attended with light clothing and without shoes. Nutritional status was determined by calculating Body Mass Index (BMI), weight (kilograms) / square of height (meters) [21].

Waist circumference (WC) was measured with a non-elastic measuring tape at the midpoint between the upper border of the anterior iliac crest and the last costal ridge, with the patient standing naked, with arms placed along the body and in the expiratory phase of breathing. The World Health Organization (WHO) states that it will be considered abdominal obesity if the WC is in men> 90 cm and in women> 80 cm [1].

Blood pressure (BP) was measured with the patient in a seated position and after a resting period of at least 5 min using a mercury sphygmomanometer and Riester sphygmomanometer (calibrated) by a single investigator previously trained to avoid inter- takes. The air cuff was placed on the left forearm. Arterial AT was taken twice at intervals of 5 min; the value used was the average blood pressure in both shots. The diagnosis of hypertension (HBP) was performed using the criteria recommended by ATP-III and IDF for age, cut point BP > 130/85 mmHg [22] and the values established by JNC 7, hypertension >140/90, pre hypertension 120–139/80–89 [23].

Students with a 12-hour fast had a sample of venous blood drawn from the elbow fold. Blood chemistry (urea, glucose, creatinine, uric acid, lipid profile: total cholesterol (TC), triglycerides, HDL) were determined.* The cut-off points for each variable were those established by WHO and IDF.

Physical inactivity of the students was defined if physical activity was not performed at least 3 times (days) a week, and as smokers those who consumed at least one cigarette a week.

The examinations were carried out in an office specially prepared for the purpose in the Faculty of Medical Sciences of the Universidad Central del Ecuador and the biochemical determinations in an internationally accredited laboratory.

A database was prepared in Microsoft Excel 2007 and statistical analysis was performed using SPSS 21. The results are presented in tables and graphs. Central tendency measures and dispersion measures were calculated for the quantitative variables, the means were compared using Student's T-Test. We also performed an Analysis of Variance (ANOVA) for the comparison of averages of the measurements performed according to the categories of BMI (normal, overweight and obesity). Associations of these variables were studied with BMI and WC using Pearson's correlation.

For qualitative variables, relative frequencies (prevalence), were calculated, and to establish associations between these variables, the $\chi 2$ test. It was considered as statistically significant differences p values less than 0.05.

3. Results

883 university students, aged 17–25 years and an average of 19.3 ± 1.4 years old, were included in the study, 67% of which were female.

Table 1 shows the average of the anthropometric and biochemical variables according to gender. A comparative analysis showed that both men and women have similar BMI, the average of the WC is increased in women, and the men have higher systolic (TAS) and diastolic (TAD) blood pressure, in women the total cholesterol and in men the triglyceride values were higher. The average difference between men and women was statistically significant (Student's *t*-test $p < 0.05$) in WC, TAS, TAD, total cholesterol, HDL cholesterol, Triglycerides and Glucose.

25.5% of the students evaluated showed some degree of overweight or obesity. It was found that 22% were overweight and 3% were obese, as shown in Fig. 1.

In women, 20.9% were overweight and 2.3% were obese, while men presented 24.7% and 4.6% of overweight and obesity, respectively. CW was altered (women> 80 / men> 90) in 52.3% of women and 26.2% of men (p0.001). HDLc was altered in 39.7% of women compared to 18.2% of men (p0.001).

The prevalence of abnormal BP was higher in men than in women (24.4% vs 9.8%, p0.001). The values of total cholesterol, LDL, triglycerides and glucose did not present statistically significant

Table 1
Average of anthropometric and biochemical variables by gender. Ecuador 2014–2015.

Source: Prepared by the authors from the study results.Variable	Women	Men	P value[a]
BMI	23.15 ± 3.06	23.57 ± 3.38	0.06
Waist Diameter (cm)	80.5 ± 7.6	84.3 ± 9.1	0.0001
TAS (mm/hg)	114 ± 10.0	119 ± 11.8	0.0001
TAD (mm/hg)	71.9 ± 8.0	75.5 ± 8.8	0.0001
Total Cholesterol (mg/dl)	160.2 ± 27.7	155 ± 29.4	0.01
c HDL (mg/dl)	53.7 ± 11.9	48.0 ± 10.0	0.0001
c LDL (mg/dl)	87.6 ± 23.6	86.6 ± 26.8	0.55
Triglycerides (mg/dl)	94.9 ± 45.6	103.0 ± 51.1	0.01
Glucose (mg/dl)	80.8 ± 6.5	81.9 ± 6.7	0.01

T−test.Source: Prepared by the authors from the study results.

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