Cardiovascular Risk Factors in University Students

Factores de riesgo de enfermedad cardiovascular en estudiantes universitarios

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ABSTRACT

Background: The beginning of university studies is usually associated with lifestyle changes, which can predispose to the development of cardiovascular risk factors (CVRF).

Objective: The aim of this study was to determine the prevalence of CVRF in first-year medical students attending Universidad Nacional del Litoral during 2017.

Methods: We conducted an analytical, cross-sectional study with consecutive sampling of 463 first-year students of the School of Medicine. The following CVRF were considered: body mass index (overweight/obesity), waist circumference (International Diabetes Federation criteria), blood pressure (bordeline blood pressure and hypertension), physical activity (low level), tobacco use (current smoker or history of former smoking), alcohol intake (binge drinking) and diet quality (unhealthy and needs improvement). The results were expressed as percentages. A hypothesis test was performed to determine a difference in proportions according to sex ($\alpha=0.05$ and 95% CI).

Results: A total of 457 students (18-21 years) were evaluated; 68% were women. The prevalence of borderline blood pressure and hypertension was significantly greater in men (28.9%). Overweight was present in 23% of the students and 18% had high waist circumference, without differences between sexes. The prevalence of current smoking or former smoking was present in 17% of the students. Binge drinking was more common in men, while the prevalence of physical inactivity was more frequent in women.

Conclusion: Most students had at least one CVRF. The high prevalence of men with borderline blood pressure and hypertension and overweight in both sexes is emphasized. Most students have to change the diet quality.

Key words: Cardiovascular Risk Factors - Obesity - Hypertension - Smoking – Alcohol Drinking - Physical Activity - Diet Quality - University Students

RESUMEN

Introducción: El comienzo de los estudios universitarios está asociado a cambios en el estilo de vida que pueden predisponer a la aparición de factores de riesgo cardiovascular (FRCV).

Objetivo: Determinar la prevalencia de FRCV en los estudiantes que en 2017 cursaron el primer año de la carrera de Medicina en la Universidad Nacional del Litoral.

Materiales y métodos: Estudio analítico, de corte transversal. Se realizó el muestreo consecutivo de 463 estudiantes de primer año de Medicina. Los FRCV considerados fueron los siguientes: IMC (sobrepeso/obesidad), circunferencia de cintura (criterios IDF), tensión arterial (presión arterial limítrofe y HTA), actividad física (nivel bajo), consumo de tabaco (exfumador y fumador actual), consumo de alcohol (consumo excesivo ocasional) y calidad de la dieta (poco saludable y mejorable). Los resultados se expresaron en porcentajes. Se realizó una prueba de hipótesis para la diferencia de proporciones, para determinar diferencias según sexo ($\alpha=0,05$ e IC del 95%).

Resultados: Se evaluaron 457 estudiantes (18-21 años), 68% eran de sexo femenino. La prevalencia de presión arterial limítrofe fue significativamente mayor en varones (28,9%). La misma tendencia se observó para HTA. El 23% presentó exceso de peso y 18% circunferencia de cintura elevada, sin diferencias entre sexos. El 17% fumaban o fumaron en el pasado. El consumo de alcohol excesivo ocasional fue mayor en los varones, mientras que un bajo nivel de actividad física fue superior en las mujeres.

Conclusión: La mayoría de los estudiantes presentaba al menos un FRCV. Se destaca la elevada prevalencia de varones con tensión arterial limítrofe y con HTA, y el exceso de peso en ambos sexos. La calidad de la dieta necesita cambios en la mayoría de los estudiantes.

Palabras clave: Factores de riesgo cardiovascular – Obesidad - Hipertensión – Tabaquismo- Consumo de alcohol - Actividad física - Calidad de la dieta - Estudiantes universitarios

INTRODUCTION

Cardiovascular diseases (CVD) are a matter of worldwide concern because of their rapid and sustained increase over decades and because they are one of the leading causes of morbidity and mortality. (1) There are numerous cardiovascular risk factors (CVRF). The World Health Organization (WHO) has classified them into non-modifiable (ethnicity and genetics), modifiable behavioral risk factors (tobacco, inadequate diet, alcohol use and insufficient physical activity) and metabolic/physiological risk factors (overweight and obesity, hypertension, hyperglycemia and hyperlipidemia). (1)

In Argentina, the 2013 National Survey of Risk Factors (NSRF) detected greater prevalence of overweight (37.1%) and obesity (20.8%) compared with the 2005 and 2009 surveys, insufficient physical activity and low intake of fruits and vegetables, while the prevalence of hypertension remained high and relatively constant (34.1%). (2) Deep inequalities were observed in the distribution of CVRF by educational level. (3)

Cardiovascular diseases generally occur in adults, but CVRF can remain silent since the very early stages of life. During childhood and adolescence, CVRF as dyslipidemia or obesity can already be detected and usually persist in adulthood, indicating that detection and prevention should be initiated as early as possible. (4, 5)

The beginning of university studies is usually associated with lifestyle changes, which can predispose to the development of CVRF. Many students come from the inland provinces of the country and have to assume new responsibilities, as buying their food. They spend many hours studying and have less time for physical activity, which may be associated with overweight and obesity. In our country, 33.1% of young people between 18-24 years of age have overweight, added to insufficient physical activity and low intake of fruits and vegetables. (2) Hypertension (HT) is another CVRF to consider in young people. In the RENATA trial, the prevalence of HT in the age group <35 years was 18.5% in men and 6.9% in women. (6)

Based on this evidence, the aim of this investigation was to determine the prevalence of CVRF, establishing differences by sex, in first-year medical students attending a public university.

METHODS

We performed an analytical cross-sectional study with consecutive sampling among 463 first-year students of the School of Medicine, Facultad de Ciencias Médicas of Universidad Nacional del Litoral (FCM-UNL) during 2017. Students with any chronic disease, pregnant or breastfeeding women, and those students who did not answer all the questions were excluded from the study. The sample was made up of 310 women and 147 men.

Among the CVRF established by WHO, we considered non-modifiable (family history), metabolic/physiological (blood pressure, waist circumference, overweight and obe-

sity) and modifiable behavioral (tobacco, alcohol, physical inactivity and unhealthy diet) risk factors. (1)

Surveys were submitted to the students and were completed in the presence of the investigators, in order to obtain information about their family history and modifiable behavioral risk factors. The IPAQ (International Physical Activity Questionnaire) was used to retrieve information about physical activity. (8)

Blood pressure (BP) was measured following the recommendations of the Consensus on Hypertension of the Argentine Society of Cardiology (9) using standard aneroid sphygmomanometers with a pressure scale in mmHg. The WHO Guide to Physical Measurements (Step 2) was used to measure height (m) and weight (kg) to calculate body mass index (BMI) and to measure waist circumference (WC). (10)

Family history was evaluated according to the ATP III (Adult Treatment Panel III) criteria, which defines risk of coronary heart disease if a male first-degree relative had myocardial infarction before the age of 55 or a first-degree female relative had myocardial infarction before the age of 65. (11)

Hypertension was defined according to the criteria established by the Argentine Consensus on Hypertension. Borderline BP (systolic BP 130-139 mmHg or diastolic BP 80-89 mmHg) was considered a risk factor. Hypertension was defined as systolic BP ≥140 mmHg and/or diastolic BP ≥ 90 mmHg). (12)

Overweight (BMI ≥25) was considered a risk factor. (13) A WC ≥90 cm in men ≥80 cm in women was deemed a risk factor, according to the recommendations of the International Diabetes Federation (IDF). (14)

Tobacco use was defined using the NSRF criteria. Smoking at least one cigarette a day or a history of former smoking was considered a risk factor. (2) Alcohol intake was evaluated according to the Dietary Guidelines for the Argentine population (GAPA), which considers binge drinking when alcohol intake is ≥56 g (in women) or ≥70 g (in men). (15)

Physical inactivity or low physical activity (not exceeding 600 MET-minutes per week) was considered a risk factor. (8)

A Dietary Quality Index (DQI) was used to analyze dietary patterns, introducing modifications to the healthy eating index proposed by Ratner et al. in 2017. (16) A food frequency questionnaire was designed with 10 variables that included five food groups that should be eaten every day, according to GAPA (1=vegetables, 2=fruits, 3=grain, legumes, bread, potatoes and pasta, 4=milk, yogurt and cheese, and 5=meat) and five food groups for occasional consumption (6=sweet and salty bakery, 7=mayonnaise, cream, butter, 8=sweets and sweetened beverages, 9=fried food, 10=sausages and cold cuts). Different frequencies of consumption were considered: daily, 4 to 6 times a week, 2 to 3 times a week, once a week, on occasions, or never). The number of servings of foods consumed every day was recorded. Each variable received a score ranging from 0 to 10, where 10 indicated that the recommendations suggested by GAPA were fulfilled. The DQI was calculated as the sum of the scores obtained for each of the variables. The score obtained was classified as healthy (>80), needs improvement (51-80) and poor (≤50), and the last two categories were considered as risk factors.

Statistical analysis

The results were expressed as percent relative frequency with its 95% CI. A hypothesis test was used to establish the differences in proportions of men and women, considering a

value of α=0.05. The statistical analysis was performed using SPSS 17 statistical package.

Ethical considerations

The protocol was approved by the Ethics Committee of FCM-UNL and was conducted following the recommendations of the Declaration of Helsinki. (7) Written informed consent was obtained from all the students to use the results of the survey and the anthropometric and blood pressure measurements. Student participation was voluntary.

RESULTS

A total of 457 students (18-21 years) were evaluated; 68% were women. Table 1 shows the prevalence of non-modifiable and metabolic/physiological CVRF for the total cohort and by sex. Few students had family history of cardiovascular disease. The prevalence of borderline BP and of HT was significantly greater in men. Overweight was present in 23% of the students and WC was above the upper limits in 18.2%, without significant differences between men and women.

The prevalence of behavioral/modifiable CVFR for the entire population and by sex is shown in Table 2.

Inadequate food quality was found in 92.8% of the students, without differences between sexes. The prevalence of tobacco use or history of former smoking was present in 17.6% of the students, with no differences between men and women. None of the students reported daily intake of alcohol. Binge drinking was significantly greater in men. The prevalence of low level of physical activity was more common in women.

Figure 1 shows the percent distribution of students as a function of the number of CVRF present. Ninety-three percent of the students presented at least one CVRF.

DISCUSSION

The present study performed on first-year medical students of FCM-UNL demonstrated a high prevalence of some CVRF, as pre-hypertension, HT, overweight and inadequate diet.

Hypertension is a silent threat to the health of all persons worldwide, affecting almost one third of the population. (17) This is a major concern because HT in young adults is believed to be increasing and is not diagnosed due to insufficient screening in this age

Table 1. Prevalence of cardiovascular risk factors in a population of university students

	Total % (95% CI)	Women % (95% CI)	Men % (95% CI)	p
Non-modifiable RF				
Family history	4.6	4.7	4.3	0.932
	(2.6-6.4)	(2.3-7.1)	(1.0-7.4)	
Metabolic/physiologic RF				
Borderline blood pressure	16.7	11.1	28.9	0.000
	(12.0-19.0)	(7.0-14.1)	(20.1-35.0)	
HT	18.5	11.4	34.1	0.000
	(14.2-22.0)	(7.1-14.2)	(26.2-42.1)	
Waist circumference	18.2	16.1	22.4	0.103
	(14.0-21.0)	(12.0-20.2)	(0.16-0.30)	
Overweight and obesity	23.0	23.2	22.4	0.840
	(19.3-27.2)	(18.0-20.2)	(15.6-29.0)	

RF: Risk factors. Results are expressed as percentage with 95% confidence interval.
The p value corresponding to each risk factor is the result of a hypothesis test for the difference in proportions according to sex, considering a value of α = 0.05. 95% CI

Table 2. Prevalence of modifiable behavioral cardiovascular risk factors in a population of university students

	Total % (95% CI)	Women % (95% CI)	Men % (95% CI)	p
Tobacco	17.6	16.1	21.6	0.166
(current smoker or history of	(14.1-21.4)	(12.0-21.3)	(15.3-28.9)	
former smoking)				
Alcohol intake	12.0	9.7	17.0	0.025
(binge drinking)	(9.1-15.3)	(6.0-13.3)	(10.9-24.0)	
Physical activity	15.3	17.7	10.2	0.038
(low level)	(12.1-18.9)	(13.1-22.4)	(5.1-16.0)	
Diet quality	92.8	92.6	93.3	0.796
(needs improvement and	(89.9-95.1)	(88.0-95.2)	(87.1-96.3)	
unhealthy)				

Results are expressed as percentage with 95% confidence interval.
The p value corresponding to each risk factor is the result of a hypothesis test for the differences in proportions according to sex, considering a value of α = 0.05. 95% CI
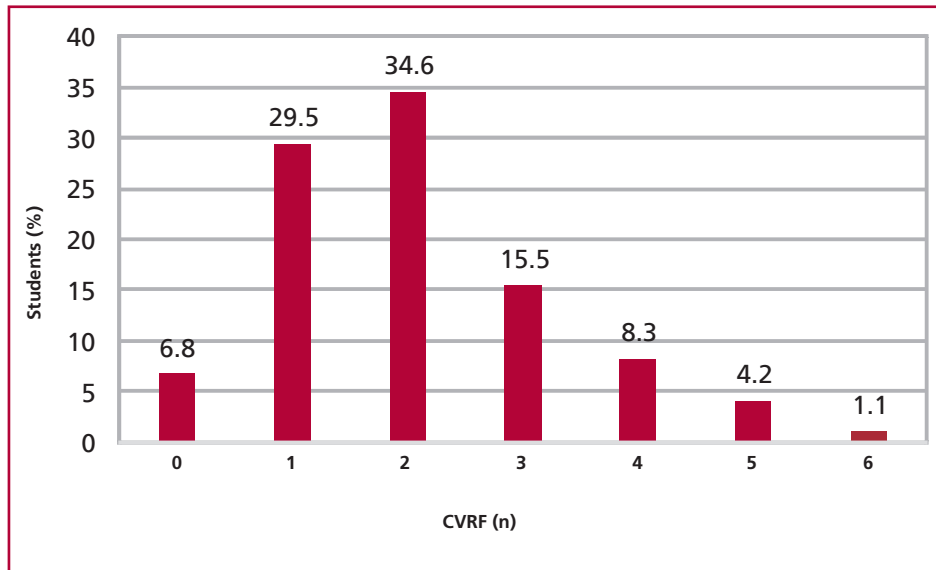
group. In the young population, detection of prehypertension is even more important, as these subjects are more likely to develop HT and increase the risk of cardiovascular events independently of other risk factors. (18) In the students evaluated, the prevalence of borderline BP was greater in men (28.9%) versus women (11.1%). The prevalence of HT is also a matter of concern in this study, particularly in men (34.1%).

The NSRF detected lower prevalence of HT for the age group between 18 and 24 years (12.8%) but only for those persons who had their BP levels measured. (2) In the RENATA trial, the incidence of HT in the age group <35 years was 18.5% in men and 6.9% in women, and these prevalences increased with age. (12) Several studies have demonstrated that the prevalence of HT and pre-hypertension is greater in men than in women, probably due to differences in the hormonal activity during early stages of life. (19, 20)

We also detected high incidence of overweight and obesity (23%), a percentage lower than the one reported by the 2013 NSRF for people of the same age group, but similar to those reported by other studies performed in university students. (21, 22) The situation was even worse among university students of the cities of Santa Fe and Córdoba, Argentina, with a prevalence of overweight of 29% and 50%, respectively. (23, 24)

Of importance, BMI as a measure of categorizing the nutritional status is useful in population-based studies, but does not provide a direct measure of body fat, and does not specify the presence of central obesity. In men, a BMI above the normal limits could reflect higher fat-free mass. Compared to BMI, abdominal obesity is a stronger predictor of diabetes and CVRF. (25)

The information obtained in this study shows that 18.2% of the students evaluated have elevated values of WC. In other studies performed on students of health science careers in our country, the prevalence WC was even higher. (23, 24) Abdominal obesity provides additional information to help physicians determine which patients should be evaluated to rule out other cardiometabolic risk factors (lipid profile and glycemia). There is evidence that total body fat assessed as BMI and abdominal fat assessed with WC are significant predictors of HT. (26)

The prevalence of tobacco use or history of former smoking was 17.6%. Previous studies performed on university students in Argentina (27, 28) and in other countries (21, 22) showed higher incidence of tobacco use. In June 2011, Argentina enacted National Law 26,687 on tobacco control, which bans smoking in indoor public spaces and workplaces, advertising and selling tobacco to minors, and requires the inclusion of health warnings on cigarette packages about the health risks of smoking. (29) Probably, these measures contributed to prevent an increase on or to control tobacco use, at least in young people.

In line with the findings of the NSRF for the population between 18 and 24 years, 17% of the students reported binge drinking during week-ends, with greater prevalence in men. This behavior is similar to the one described in studies performed on students of health science careers in Santa Fe and Buenos Aires (Argentina). (23, 28, 30) Binge drinking among university students has also been associated with social motivation. (31) In Santa Fe, the municipal regulation 11,618/2009 prohibits grocery stores from selling alcoholic beverages at night. The National Law to Combat Alcoholism provides further restrictions on alcohol consumption and advertising of alcoholic beverages. (32)

There is evidence that when young adults start

university, they tend to develop unhealthy behaviors, including a diet of low nutritional quality. (33, 34). Our country lacks population-based studies about the quality of food eaten by this age group.

The DQI used in this analysis allows a comprehensive view of students' nutritional patterns; 92.8% of the students surveyed need to improve their dietary behaviors, with no differences between men and women. These results are in line with those of a previous research carried out on students of the same school of medicine in 2011, which evaluated the diet quality using other DQI; the survey also concluded that 95% of students should improve their diet. (23). A study performed on students from the School of Medicine in Buenos Aires described that their diet presented high consumption of calorie dense processed food poor in nutrients. (28)

Several studies agree that regular moderate-intensity physical activity prevents the development of obesity and is beneficial for health. However, a sedentary behavior, defined as a sitting, reclining or lying posture, has become increasingly prevalent in modern societies due to changes in the physical, social, and economic environment. (35) University students are a subgroup of the general population that is prone to a sedentary behavior. A cross-sectional study performed in Canada reported that students spend an average of 11.65 hours per week-day on sedentary behaviors at the university. (36) Sedentary behavior is generally associated with physical inactivity. (37)

In Argentina, the NSRF detected that almost half of the population between 18 and 24 years were insufficiently physically active according WHO recommendations. In this study, 18% presented low level of physical activity, with greater prevalence in women. Other investigations performed on students from different places of our country and using the same instrument showed variable results. In the city of Santa Fe, almost 50% of the students of the School of Biochemistry do not achieve the minimum level of physical activity recommended by WHO. (30) An analysis conducted on students in the city of Cordoba reported that physically inactive students (30%) were more likely to have overweight and excess body fat than active students. (24) Physical activity should be promoted, as it is inversely related to the level of body fat, improves mood and decreases the risk of stress, which is common in many university students. (24, 38)

Limitations

A limitation of this study is the lack of blood sugar level and lipid profile assessments, preventing long-term cardiovascular risk evaluation, which is particularly relevant in young people. (39) Despite this limitation, the fact that 93% of first-year medical students at UNL already have at least one CVRF commits ourselves to implement effective measures to achieve lifestyle changes, as Zilberman et al. have already demonstrated. (40)

CONCLUSIONS

The prevalence of borderline BP and HT is significant among the students evaluated. Overweight and inadequate diet are also matters of concern. Most young adults have at least one CVRF. These data highlight the need to implement preventive measures to minimize the risks of CVD or delay its onset, and also contribute to the education of students as health promoters.

Conflicts of interest

None declared. (See authors' conflicts of interest forms on the website/Supplementary material).

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