Nutrición Hospitalaria
ISSN: 0212-1611
info@nutricionhospitalaria.com
Grupo Aula Médica
España

Costa Silva Zemdegs, J.; Barreto Corsi, L.; De Castro Coelho, L.; Duarte Pimentel, G.; Toyomi Hirai, A.; Sachs, A.
Lipid profile and cardiovascular risk factors among first-year Brazilian university students in São Paulo
Nutrición Hospitalaria, vol. 26, núm. 3, mayo-junio, 2011, pp. 553-559
Grupo Aula Médica
Madrid, España

Available in: http://www.redalyc.org/articulo.oa?id=309226772018
Lipid profile and cardiovascular risk factors among first-year Brazilian university students in São Paulo

J. Costa Silva Zemdegs¹, L. Barreto Corsi¹, L. De Castro Coelho¹, G. Duarte Pimentel¹, A. Toyomi Hirai¹ and A. Sachs¹


Abstract

Background/aims: The surveillance of cardiovascular risk factors has been recommended worldwide. The current study aimed to estimate the prevalence of cardiovascular risk factors among first-year students from a public university in the city of São Paulo, Brazil.

Methods: A cross-sectional study of 56 first-year students, of both genders, was performed. Information about demographic characteristics, family history of chronic diseases, smoking, and physical activity was obtained by means of a standardised questionnaire. Anthropometric parameters (BMI, waist circumference, body fat percentage), metabolic parameters (glycaemia, serum lipid profile), and dietary data (total energy intake, percentage of total energy from macronutrients, cholesterol and dietary fiber) were assessed.

Results: The risk of cardiovascular diseases was characterised by family history of cardiovascular diseases (44.6%), smoking (10.7%), physical inactivity (35.7%), borderline high total cholesterol and LDL-c levels (16.1% and 5.4, respectively), decreased HDL-c levels (8.9%), increased triglyceride levels (8.9%), and overweight and obesity (17.8% and 7.1%, respectively). The diet of the students was inadequate: it was high in fat and protein, and low in carbohydrate and dietary fibre.

Conclusions: The prevalence of risk factors for cardiovascular diseases in young adults draws attention to the need to adopt preventive plans in the university setting.

DOI:10.3305/nh.2011.26.3.4660


Resumen

Antecedentes/objetivos: la vigilancia de los factores de riesgo se ha recomendado mundialmente. El presente estudio pretende estimar la prevalencia de los factores de riesgo cardiovascular en estudiantes de primer año de una universidad pública de la ciudad de Sao Paulo, Brasil.

Métodos: Se realizó un estudio transversal de 56 estudiantes de primer año, de ambos sexos. Se obtuvo información acerca de las características demográficas, antecedentes familiares de enfermedades crónicas, hábito fumador y actividad física mediante un cuestionario estandarizado. Se evaluaron parámetros antropométricos (IMC, circunferencia de la cintura, porcentaje de grasa corporal), bioquímicos (glucemia, perfil lipídico) y dieta (total energía, porcentaje de energía total de macronutrientes, colesterol y fibra de la dieta).

Resultados: el riesgo de enfermedades cardiovasculares se caracterizó por los antecedentes familiares de enfermedades cardiovasculares (44.6%), hábito tabáquico (10.7%), inactividad física (35.7%), límite superior de colesterol total y LDL-c (16.1% y 5.4, respectivamente), disminución de las concentraciones de HDL-c (8.9%), aumento de las concentraciones de triglicéridos (8.9%), y sobrepeso y obesidad (17.8% y 7.1%, respectivamente). La dieta de los estudiantes fue inadecuada: estaba alta en grasa y proteínas y baja en carbohidratos y fibra de la dieta.

Conclusiones: la prevalencia de factores de riesgo para enfermedades cardiovasculares en adultos jóvenes reclama la atención hacia la necesidad de planes preventivos en el ámbito universitario.

DOI:10.3305/nh.2011.26.3.4660

Introduction

Cardiovascular diseases remain the leading cause of death worldwide, and in Brazil these diseases are responsible for more than 48% of the total number of deaths. Several risk factors for cardiovascular diseases have been identified, increasing the ability to prevent and manage chronic conditions. Risk factors for cardiovascular diseases comprise modifiable variables (smoking, sedentary lifestyle, inappropriate dietary habits, hypertension, hypercholesterolaemia, glucose intolerance, and obesity) and non-modifiable variables (age, gender, race, and heredity). Although cardiovascular diseases typically occur in middle age or later, risk factors for these diseases are determined to a large extent by lifestyle behaviours learned early in life and maintained during adulthood. In Brazil, in part due to changes in dietary habits and the degree of physical activity, a high prevalence of cardiovascular risk factors, particularly overweight and a sedentary lifestyle, have been reported among young adults.

Given that several cardiovascular risk factors are modifiable, it is necessary to determine prevalence of these risk factors and, if the results warrant, to carry out prevention programs aimed at reducing their frequency. The aim of this study was to examine the prevalence of some of the main cardiovascular risk factors in a population of first-year students from a public university in a city in the southeast region of Brazil.

Methods

In the 2005 academic year, all first-year university students from a Brazilian public university, located in the city of Sao Paulo, were invited to take part in the present study. Fifty-six students pursuing career in the medical field (20% men, mean age 19.7 ± 0.9 years; and 80% women, mean age 20.6 ± 2.6 years) voluntarily participated in the study, representing 19% of the student population who entered the university that year. The study was approved by the Human Research Ethics Committee of the Federal University of Sao Paulo and all participants signed a consent form for participation in the protocol.

A standardised interview was carried out together with an anthropometric assessment by a team of expert nutritionists at the Student Health Services of the university. Through the standardised interview, information regarding family history of chronic diseases, regardless of the age of onset, as well as lifestyle habits such as smoking and physical activity were obtained. Smoking was classified in accordance of the Centers of Disease Control and Prevention and the Brazilian Health Ministry. Sedentary lifestyle was defined as being fewer than two weekly periods of physical activity with at least 30 minutes of duration.

Anthropometric assessment consisted of measurements of weight, height, waist circumference (WC) and skin folds, performed with the student in the standing position, barefoot, and in light garments. Weight and height were obtained by means of a scale bearing a stadiometer (Filizola®, model 31, Sao Paulo, Brazil). WC was obtained by means of a non-stretch fibreglass metric tape in the midline between the lower costal margin and the iliac crest. Body mass index (BMI) and WC were classified in accordance with the parameters of the World Health Organization. Four skin fold thickness were measured on the left side of the body, in triplicate, to the nearest 0.1 mm, by means of a Lange skin-fold calliper (Cambridge Scientific Industries, Inc.). The skin fold of the triceps was measured on the vertical fold, on the posterior midline of the upper arm (halfway between the acromion and olecranon processes, with the arm held freely to the side of the body). The biceps skin fold was also measured on the vertical fold, on the anterior aspect of the arm over the belly of the biceps muscle, 1 cm above the level used to mark the triceps site. The subscapular skin fold was taken from the diagonal fold at a 45° angle, 1 to 2 cm below the inferior angle of the scapula; and the suprailiac skin fold, also taken from the diagonal fold (in line with the natural angle of the iliac crest), was taken in the anterior axillary line immediately superior to the iliac crest. The body density was calculated from the sum of the four skin folds, and the body fat percentage (%BF) was obtained and classified in accordance with Siri and Lohman, respectively.

Dietary data were evaluated by means of a non-consecutive three-day food record. Participants were provided with food record forms and were taught how to complete them. Total energy intake and percentage of total energy from macronutrients were obtained using the software NutWin® version 2.5 (Center for Health Informatics, Federal University of Sao Paulo, Sao Paulo, Brazil), and data were analysed in accordance with the recommendations of the World Health Organization and the Institute of Medicine.

Annually, all students are assessed for metabolic parameters at the Student Health Services of the university. In brief, blood samples were collected after overnight fasting by a team of nurses from the Central Laboratory of the Sao Paulo Hospital. Glycaemia was determined in plasma fluoride, and triglycerides, total cholesterol, and HDL-c were determined in serum by means of conventional laboratory enzymatic techniques. LDL-c and oxidised LDL-c levels were calculated using the equations of Friedwald et al. and Tsimihodimos et al., respectively. The metabolic parameters were analysed according to the definitions of the Brazilian Diabetes Society and the National and International Cholesterol Education Program-NCEP/ATPIII. The prevalence of metabolic syndrome was assessed according to the NCEP/ATPIII classification.

Statistical analyses were performed using the software GraphPad Prism, version 4.03 (GraphPad Soft-
Descriptive analysis was carried out using means, standard deviations and percentages. The normality of the distributions was assessed using the D’Agostino-Pearson test. Comparisons between two variables were done using the Mann-Whitney test or the Kruskal-Wallis test for continuous variables and using the Fischer’s exact test or the Fisher-Freeman-Halton test for the comparison of percentages. Correlations between anthropometric and metabolic parameters were determined using the Spearman correlation test. The level of significance was set at $p < 0.05$.

**Results**

A family history of dyslipidaemia was present in 18.2% of males and 44.4% of females; hypertension in 45.5% and 55.6% (respectively), diabetes mellitus in 54.5% and 71.1%, overweight/obesity in 45.5% and 44.4%, and cardiovascular disorders in 45.5% and 44.4%. None of the men and 13.3% of the women were smokers, and a sedentary lifestyle was presented in 27.3% of the men and 37.8% of the women, with no differences between genders in any of these variables.

Data regarding anthropometric and metabolic parameters of the students according to gender are summarised in Table 1. The mean values for BMI and WC were in the normal range for both men and women, with no differences between genders in any of these variables. 

The mean %BF levels were in the normal range for men, and they were mod-
erately high for women. The mean %BF levels were significantly higher in women than in men (P < 0.001) and an increased %BF was observed in 57.8% of the women.

The mean fasting glycaemia levels were in the normal range for both men and women and did not differ between genders. A significant alteration in fasting glycaemia concentration was observed in neither gender. Mean total cholesterol, LDL-c, oxidised LDL-c, HDL-c and triglycerides levels were in the normal range for both genders. Women presented mean total cholesterol and HDL-c levels that were higher than those of the men (P < 0.001), mean LDL-c levels tended to be higher in the women (P = 0.08), and mean oxidised LDL-c levels were higher in men than in women (P < 0.001). Dyslipidaemias, characterised by increased levels of total cholesterol, LDL-c and triglycerides were not observed in the present sample. However, borderline high total cholesterol levels were observed in 20.0% of the women, borderline high LDL-c levels were observed in 9.1% of the men and 4.4% of the women and borderline high triglycerides levels were observed in 9.1% of the men and 8.9% of the women, with no difference between genders. Additionally, reduced HDL-c levels were observed in 45.5% of the men and none of the women. Tables 2 and 3 show the mean levels of the metabolic parameters, according to the other cardiovascular risk factors analysed. In the present sample, it was not able to observe any statistically significant associations between the metabolic parameters and the other cardiovascular risk factors. Importantly, BMI showed a directly proportional relation to WC (P < 0.001), BF% (P < 0.001), total cholesterol (P = 0.04), LDL-c (P = 0.01), and triglyceride levels (P = 0.04). Based on the parameters evaluated, i.e., WC, fasting glycaemia, HDL-c, and triglycerides levels, no men or women had metabolic syndrome.

**Discussion**

Epidemiological trends indicate that there will be an increase in incidences of cardiovascular diseases worldwide, particularly in developing countries. Accordingly, the incidence of cardiovascular risk factors has increased among Brazilians in recent years, and mortality from cardiovascular diseases remains the...
leading cause of death in Brazil.2 The reversal of this situation requires the adoption of preventive measures, which has been extensively shown to be effective in modifying cardiovascular risk factors.21,22 In view of this, the identification of groups with risk factors for cardiovascular diseases is essential for the development of effective preventive plans.

In agreement with national and international literature, the data from the present study shows a considerable prevalence of cardiovascular risk factors among young adults. A family history for chronic diseases was reported by many of the university students. Several studies have revealed a greater prevalence of cardiovascular risk factors among relatives of individuals with cardiovascular diseases and type 2 diabetes mellitus, when compared with those without family history of these diseases.23,24

An important prevalence of smoking and sedentary lifestyle has been reported in Brazilian young adults,25,26 and in the present sample as well. Smoking is one of the greatest risk factors for cardiovascular diseases, and even in young people, a relationship between serum lipoprotein cholesterol concentrations and smoking has been reported.27 A sedentary lifestyle has been shown to be an independent risk factor for cardiovascular diseases.28,29 Currently, computers occupy a great part of the students’ time, and this habit has been shown to be negatively associated with physical activity.30 Additionally, the possible reduction in extracurricular activities after entering university might have contributed to the elevated frequency of a physical inactivity.

Anthropometric variables have extensively been shown to predict cardiovascular risk.31 A considerable prevalence of overweight and obesity, particularly in women, was observed among university students. According to other cardiovascular risk factors

<table>
<thead>
<tr>
<th>Table III</th>
<th>Means and standard deviations of serum total cholesterol, triglycerides and glycaemia according to other cardiovascular risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total cholesterol</td>
</tr>
<tr>
<td></td>
<td>Triglycerides</td>
</tr>
<tr>
<td></td>
<td>Glycaemia</td>
</tr>
<tr>
<td></td>
<td>Men</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Body Mass Index (kg/m2)</td>
<td></td>
</tr>
<tr>
<td>&lt; 18.5</td>
<td>157.7 ± 18.1</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>147.7 ± 14.7</td>
</tr>
<tr>
<td>≥ 25.0</td>
<td>–</td>
</tr>
<tr>
<td>Waist Circumference (cm)</td>
<td></td>
</tr>
<tr>
<td>&lt; 94 (M); 80 (W)</td>
<td>141.4 ± 17.8</td>
</tr>
<tr>
<td>94-102 (M); 80-88 (W)</td>
<td>–</td>
</tr>
<tr>
<td>≥ 102 (M); 88 (W)</td>
<td>–</td>
</tr>
<tr>
<td>Body fat (%)</td>
<td></td>
</tr>
<tr>
<td>&lt; 19.9 (M); 24.9 (W)</td>
<td>141.2 ± 17.6</td>
</tr>
<tr>
<td>≥ 20.0-25.0 (M); 25-29.9 (W)</td>
<td>151.7 ± 8.1</td>
</tr>
<tr>
<td>≥ 25.1 (M); 30.0 (W)</td>
<td>–</td>
</tr>
<tr>
<td>Sedentary Lifestyle</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>135.5 ± 33.2</td>
</tr>
<tr>
<td>No</td>
<td>141.6 ± 14.9</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>No</td>
<td>141.4 ± 17.8</td>
</tr>
</tbody>
</table>

Mann-Whitney test (m); Kruskal-Wallis test (k).
Despite the frequency of students with undesirable serum lipids and inadequate diet composition, we were unable to observe any association between serum parameters, dietary data and the other cardiovascular risk factors. Intra-individual variability, both in the diet and in serum parameters, have been shown to reduce the possibility of detecting the presence of associations in one population, i.e., associations are clearer in studies aiming to compare different populations.42 On the other hand, in this study, BMI showed a directly proportional relationship with serum total cholesterol and LDL-c levels. The greater the BMI, the greater the prevalence of higher than desired values for these parameters, which indicates the importance of this simple and inexpensive anthropometric evaluation.

To sum up, an important prevalence of cardiovascular risk factors was observed in the university students included in the present study. Considering that some of the cardiovascular risk factors are modifiable by changes in lifestyle, educational programs aimed at motivating the adoption of healthy lifestyle choices, as it is those who will be taking care of the health of the population in the future.

Acknowledgements

The authors would like to acknowledge the postgraduate fellowships from the Foundation of Administrative Development (Fundap, Brazil) and the National Council of Technological and Scientific Development (CNPq, Brazil).

References


Table IV

<table>
<thead>
<tr>
<th>Energy (kcal)</th>
<th>Men Mean ± SD</th>
<th>Women Mean ± SD</th>
<th>%</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,940 ± 829.5</td>
<td>2,131.2 ± 527.4</td>
<td>&lt; 0.001 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrate (% E)</td>
<td>46.9 ± 13.4</td>
<td>52.1 ± 10.1</td>
<td>0.10 m</td>
<td></td>
</tr>
<tr>
<td>&lt; 55.0%</td>
<td>81.8</td>
<td>53.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55.0-75.0%</td>
<td>18.2</td>
<td>46.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein (% E)</td>
<td>17.2 ± 3.2</td>
<td>15.9 ± 3.2</td>
<td>0.17 m</td>
<td></td>
</tr>
<tr>
<td>10.0-15.0%</td>
<td>36.4</td>
<td>37.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 15.0%</td>
<td>63.6</td>
<td>62.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipid (% E)</td>
<td>36.0 ± 14.3</td>
<td>32.0 ± 9.2</td>
<td>0.15 m</td>
<td></td>
</tr>
<tr>
<td>15.0-30.0%</td>
<td>36.4</td>
<td>37.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 30.0%</td>
<td>63.6</td>
<td>62.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>188.8 ± 85.7</td>
<td>197.8 ± 44.6</td>
<td>0.43 m</td>
<td></td>
</tr>
<tr>
<td>&lt; 300 mg/d</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibre (g)</td>
<td>14.7 ± 5.3</td>
<td>11.8 ± 5.6</td>
<td>0.25 m</td>
<td></td>
</tr>
<tr>
<td>&lt; 25.0 g/d</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% of Energy (% E); Mann Whitney test (m); Fisher exact test (f).
12. Lohman TG, Roche AF, Martorell R. Anthropometric stan-


14. Institute of Medicine (IOM), Food and Nutrition Board: Dietary Reference intake: for energy, carbohydrate, fiber, fatty

15. Friedwald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein in plasma without use
of the preparative ultracentrifuge. Clin Chem 1972; 18: 499-
502.

16. Tsimihodimos V, Gazi I, Kostara C, Tsleipsis AD, Eliasf M. Plasma lipoproteins and triglyceride levels of healthy, small,

17. Sociedade Brasileira de Diabetes. Tratamento e acompan-

18. The Third Report of the National Cholesterol Education Pro-
gram (NCEP). Expert Panel on Detection. Evaluation and treat-

19. Misra A, Khurana L. Obesity and the metabolic syndrome in
developing countries. J Clin Endocrinol Metab 2008; 93
(Suppl. 1): S9-30.

20. World Health Organization. Global Strategy on Diet, Physical

36 (2): 227-44.

22. Carasale M, Pérez de Heredia F. Behavioural therapy in the

having a family history of type 2 diabetes or cardiovascular dis-
ease a predictive factor for metabolic syndrome? Prim Care

 Relatives of Type 2 Diabetic Patients. Rev Diabet Stud 2007; 4
(3): 177-184.

25. Fishberg RM, Stella RH, Morimoto JM, Pasquali LS, Philippi
ST, Latorre MRDO. Perfil Lipídico de Estudantes de Nutrição e
a sua Associação com Fatores de Risco para Doenças Cardio-

26. Bion FM, Chagas MH, Muniz Gde S, de Souza LG. Nutritional
status, anthropometrical measurements, socio-economic status, and physical activity in Brazilian university students. Nutr

27. PDAY Research Group. Relationship of atherosclerosis in young
men to serum lipoprotein cholesterol concentrations and smoking. A preliminary report from the Pathobiological Deter-

Bustamante MJ, Marqués F, Fernández M, Navarrete C. Asso-
737-45.

29. Vanhecke TE, Franklin BA, Miller WM, de Jong AT, Coleman
CF, McCullough PA. Cardiorespiratory fitness and sedentary
lifestyle in the morbidly obese. Clin Cardiol 2009; 32 (3): 121-
4.

30. Fotheringham MI, Wonnacott RL, Owen N. Computer use and
physical inactivity in young adults: Public health perils and
potentials of new information technologies. Annals of Behav-

mass index, waist circumference and waist: hip ratio as predic-
Nutr 2010; 64: 16-22.

32. Corbelho VG, Caetano LF, Liberatore Júnior Rdel R, Cordeiro
JA, Souza DR. Lipid profile and risk factors for cardiovascular
diseases in medicine students. Arq Bras Cardiol 2005; 85 (1):
57-62.

33. Roldan CM, Herreros PV, Andres AL, Sanz JMC, Azcona AC.
Nutritional status assessment in a group of university students
by means of dietary parameters and body composition. Nutr

34. Izaga MA, Pablo AMR, Alday A, Apalanza EP, Berti IS. Calidad
de la dieta, sobrepeso y obesidad en estudiantes universitarios.

35. Lewington S, Whitlock G, Clarke R et al. Blood cholesterol and
vascular mortality by age, sex, and blood pressure: a meta-
analysis of individual data from 61 prospective studies with 55

36. Castelli WP, Anderson K, Wilson PW et al. Lipids and risk of
coronary heart disease. The Framingham Study. Annals of Epi-

37. McQueen MJ, Hawken S, Wang XY et al. Lipids, lipoproteins,
and apolipoproteins as risk markers of myocardial infarction in
52 countries (the INTERHEART study): a case-control study.

38. Cervato AM, Dernil AM, Latorre MRDO, Marucci MPN. Edu-
cação nutricional para adultos e idosos: uma experiência posi-
tiva em Universidade Aberta para a Terceira Idade. Revista de

risk of dietary stearic acid compared with trans, other saturated,
and unsaturated fatty acids: a systematic review. Am J Clin

40. Djoussé L, Gaziano JM. Dietary cholesterol and coronary

41. Byrd-Williams CE, Strother ML, Kelly LA, Huang TT. Dietary
fiber and associations with adiposity and fasting insulin among
college students with plausible dietary reports. Nutrition 2009;
25 (9): 896-904.

42. Dressler WW, Santos JE, Viteri FE, Gallagher Jr PN. Social
dietary predictors of serum lipids: a Brazilian example. Soc