

# Risk factors for cardiovascular disease in professors from a public university

Oswaldo Costa Moreira<sup>1</sup>  
 Renata Aparecida Rodrigues de Oliveira<sup>2</sup>  
 Cláudia Eliza Patrocínio Oliveira<sup>3</sup>  
 Leonice Aparecida Doimo<sup>4</sup>  
 Paulo Roberto dos Santos Amorim<sup>5</sup>  
 Mateus Camaroti Laterza<sup>6</sup>  
 Wallace David Monteiro<sup>7</sup>  
 João Carlos Bouzas Marins<sup>8</sup>

- 1 Physical Educator, Master. Professor, Universidade Federal de Viçosa -UFV-, Florestal/MG – Brazil.  
e-mail: osvaldo.moreira@ufv.br
- 2 Physical Educator, Master's student. UFV, Viçosa/MG – Brazil.  
e-mail: renata.oliveira@ufv.br
- 3 Physical Educator, Master. Professor, UFV, Viçosa/MG – Brazil.  
e-mail: cpatrocinio@ufv.br
- 4 Physical Educator, Ph.D. Professor, UFV, Viçosa/MG – Brazil.  
e-mail: ladoimo@ufv.br
- 5 Physical Educator, Ph.D. Professor, UFV, Viçosa/MG – Brazil.  
e-mail: pramorim@ufv.br
- 6 Physical Educator, Ph.D. Professor, Universidade Federal de Juiz de Fora, Juiz de Fora/MG – Brazil.  
e-mail: mateus.laterza@ufjf.edu.br
- 7 Physical Educator, Ph.D. Professor, Professor, Universidade Estadual do rio de Janeiro, Rio de Janeiro/MG – Brazil.  
e-mail: wdm@uerj.br
- 8 Physical Educator, Ph.D. Professor, UFV, Viçosa/MG – Brazil.  
e-mail: jcbouzas@ufv.br

**Article linked to research:** Prevalência dos fatores de risco coronariano em professores da Universidade Federal de Viçosa

**Conflicts of interests:** none.

**Receipt date:** Jun 12, 2013.

**Approval date:** Oct 7, 2013.

**How to cite this article:** Moreira OC, Oliveira RAR, Oliveira CEP, Doimo LA, Amorim PRS, Laterza MC, *et al.* Risk factors for cardiovascular disease in professors from a public university. *Invest Educ Enferm.* 2014;32(2): 280-290.

## Risk factors for cardiovascular disease in professors from a public university

**Objective.** To determine the prevalence of risk factors for cardiovascular disease among professors of a public university.

**Method.** This cross-sectional study included 145 professors from the Federal University of Viçosa (UFV), MG, Brazil, in 2010. Analyzed variables included age, weight, height, waist, hip and abdominal circumferences, in addition to total cholesterol, triglycerides, glucose, and resting systolic and diastolic blood pressures. **Results.** A total of 71% were men, the average age of the men was higher than that of the women (46.9 versus 43.2 years old); half of the participants were overweight (46.9% were overweight and 9.0% were obese). Other factors were: 17.2% presented a waist-hip ratio at risk; 46.9% had greater than normal abdominal circumference; 4.0% presented high total cholesterol, 20.2% high triglycerides, 4.8% of the individuals presented abnormal glucose metabolism; and 16.6% were hypertensive. In comparison with men, women presented lower systolic blood pressure, diastolic blood pressure, body mass index, and abdominal, hip and waist circumferences. There was a trend of increased waist/hip and abdominal circumferences, total cholesterol, triglycerides, and systolic blood pressure as individuals aged. **Conclusion.** The college professors addressed in this study present important risk factors for cardiovascular disease. Hence, prevention and control measures need to be implemented in order to reduce the problem, a process in which nursing professionals play a key role in the achievement of success.

**Key words:** faculty; chronic disease; body weights and measures; risk factors.

## Factores de riesgo para enfermedad cardiovascular en profesores de una universidad pública

**Objetivo.** Determinar la prevalencia de factores de riesgo para enfermedad cardiovascular en profesores de una universidad pública. **Metodología.** Estudio de corte transversal. Se evaluaron

145 profesores de la Universidad Federal de Viçosa-MG (UFV), en 2010. Las variables analizadas fueron edad, peso, talla, circunferencia de cintura, cadera y abdominal, además del colesterol total, triglicéridos, glucosa y tensión arterial sistólica y diastólica en reposo. **Resultados.** 71%, hombres; la edad promedio de estos fue mayor que la de las mujeres (46.9 versus 43.2 años), uno de cada dos participantes estaba pasado de peso (46.9% sobrepeso y 9.0% obesidad). Otros factores observados fueron: un 17.2% tenía un índice cintura/cadera de riesgo; el 46.9%, alta circunferencia abdominal; el 4.0%, colesterol total alto; el 20.2%, triglicéridos altos; un 4.8%, con metabolismo anormal de glucosa y 16.6% hipertensos. En comparación con los hombres, las mujeres tenían valores más bajos para la presión arterial sistólica, presión arterial diastólica, índice de masa corporal, circunferencia abdominal y la relación cintura/cadera. Hubo una tendencia al aumento de los valores de las variables de la relación cintura/cadera, circunferencia abdominal, el colesterol total, los triglicéridos y la presión arterial sistólica, con el aumento de edad. **Conclusión.** Los profesores universitarios participantes en este estudio tienen importantes frecuencias de exposición a factores de riesgo para enfermedad cardiovascular. Es necesario implementar medidas de prevención y control para la reducción de esta problemática, en las cuales Enfermería es clave para su éxito.

**Palabras clave:** docentes; enfermedad crónica; pesos y medidas corporales; factores de riesgo.

### Fatores de risco para doença cardiovascular em professores de uma universidade pública

**Objetivo.** Determinar a prevalência de fatores de risco para doença cardiovascular em professores de uma universidade pública. **Metodologia.** Estudo de corte transversal. Avaliaram-se 145 professores da Universidade Federal de Viçosa-MG (UFV), em 2010. As variáveis analisadas foram idade, peso, medida, circunferência de cintura, quadril e abdominal, além do colesterol total, triglicérides, glicose e tensão arterial sistólica e diastólica em repouso. **Resultados.** 71% eram homens, a idade média dos homens foi maior que a das mulheres (46.9 contra 43.2 anos), um de cada dois participante tinha estado passado de importância (46.9% sobrepeso e 9.0% obesidade). Outros fatores observados foram: 17.2% tinha um índice cintura/quadril de risco, 46.9% com alta circunferência abdominal, 4.0% com colesterol total alto, 20.2% de triglicérides altos, um 4.8% com metabolismo anormal de glicose e 16.6% foram hipertensos. Em comparação com os homens, as mulheres tinham valores mais baixos para a pressão arterial sistólica, pressão arterial diastólica, índice de massa corporal, circunferência abdominal e a relação cintura/quadril. Teve uma tendência ao aumento dos valores das variáveis da relação cintura/quadril, circunferência abdominal, o colesterol total, os triglicérides e a pressão arterial sistólica, com o aumento de idade. **Conclusão.** Os professores universitários deste estudo têm importantes frequências de exposição a fatores de risco para doença cardiovascular. É necessário implementar medidas de prevenção e controle para a redução desta problemática, nas quais Enfermagem é importante para seu sucesso.

**Palavras chave:** docentes; doença crônica; pesos e medidas corporais; fatores de risco.

## Introduction

Since 1970, cardiovascular diseases are the main cause of morbidity and mortality in Brazil, accounting for one third of all deaths in the adult population.<sup>1</sup> Distinct regional patterns are, however, reported by some epidemiological surveys<sup>1-3</sup> concerning the prevalence of cardiovascular risk factors (CRF). Data related to cardiovascular risks found in Brazil are consistent

but are restricted to certain regions and population strata.<sup>4</sup> Therefore, analysis of the prevalence of CRF in different regions and populations can provide information that will contribute to the establishment of national guidelines seeking to meet the specific characteristics of each population<sup>5</sup> and inform health workers, such as nurses, physicians, physical educators, and

nutritionists, so that these professionals can estimate the risk of a given individual to develop diseases and then apply appropriate measures according to the magnitude of risk.

Additionally, after characterizing CRF in specific populations, the health professionals can devise and implement educational strategies and intervention protocols to improve the use of existing resources. For this reason, when discussing specific populations, one should take into account the relationship between the individual and the environment, as well as the individual's professional occupation.<sup>6</sup> Sex and age also influence risk behavior related to cardiovascular risk. Hence, there is a need to identify the risk among women and men belonging to different age groups to establish specific preventive or therapeutic measures, monitoring the aging process in each sex. Various studies addressing CRF have been conducted with specific population strata, such as workers from the food industry,<sup>3</sup> university employees,<sup>7-11</sup> and also adult individuals from metropolitan regions<sup>4,5</sup> and cities in the interior<sup>2,12</sup> of Brazil, making it clear that certain population groups present specific characteristics along with regional characteristics, that may influence the prevalence of CRF.

Therefore, knowledge concerning the prevalence of CRF in a population stratum such as college professors, in which a magnitude of risk is established between sexes and among different age groups, can aid health professionals in establishing preventive and/or therapeutic measures to reduce CRF on the morbidity and mortality of this population. In this sense, this study's objective was to determine the prevalence of CRF among professors of a public university and compare the differences between sexes and among age groups.

## Methodology

A cross-sectional epidemiological study was conducted with a population of professors working

at the Federal University of Viçosa (UFV), MG, Brazil, regardless of gender, ethnicity or age, in 2010. The sample size was computed using the Lwanga and Lemeshow<sup>13</sup> formula. Considering the total number of professors (N=767) in the institution, a standard error of 5%, and a confidence interval of 98%, a sample of 138 professors was needed for probabilistic confidence. A total of 103 men (71.03%) and 42 women (28.97%), corresponding to 18.9% of the faculty at UFV, participated in the study. All the professors were informed of the study and invited to participate in it after the Institutional Review Board approved the project (Of. Ref. No. 009/2009). Individual assessments were scheduled after professors consented and signed free and informed consent forms.

The participants were assessed in the Human Performance Laboratory of the Physical Education Department, UFV, in an acclimatized room (around 22°C and 55% of humidity). An experienced evaluator, previously trained to administer the study, performed a standard procedure: participants were confirmed to be rested in order to measure resting parameters, anthropometry, capillary sampling, and estimate the cardiorespiratory component. Individual reports were prepared afterward. The following variables were taken into account: age, body mass, height, waist circumference (WC), hip circumference (HC), and abdominal circumference (AC). Serum levels of total cholesterol (TC), triacylglycerol (TG), and blood glucose (Gluc) were also measured together with resting systolic (SBL) and diastolic (DBP) blood pressures.

Measurement and classification of body mass, height, WC, HC, and AC along with body mass index (BMI), and waist-hip ratio (WHR) followed the World Health Organization (WHO) guidelines,<sup>14,15</sup> and complied with specific parameters for both women and men. TC, TG, and glucose were collected through digital puncturing while the participant was in a rested state and had fasted for at least 4 hours. The equipment used for blood analysis included Accutrend PLUS for TC and TG, and Accu-Chek Go for glucose. The

classification of the values obtained for TC and TG followed NCEP<sup>16</sup> criteria, while classification of glucose values followed those provided by the American Diabetes Association.<sup>17</sup> All the blood collection and analysis procedures were performed using disposable material. Measurements and classification of SBP and DBP complied with criteria from the Brazilian Society of Cardiology.<sup>18</sup> Data were stored and analyzed using Sigma Stat for Windows, version 2.03. Data analysis included descriptive statistics of variables. Correlation among variables was verified using the Pearson correlation coefficient. Differences between men and women were found using Student's t-test and the ANOVA one way with post-hoc Tukey was used for the age groups. A level of significance of  $p < 0.05$  was adopted for all the treatments.

## Results

The average BMI of professors was  $25.14 \pm 13.62$  Kg/m<sup>2</sup>. There was an overall prevalence of being overweight in 46.89% of the individuals and of obesity in 8.96% of the individuals. There was no indication of low weight for either of the sexes. The average WHR was  $0.89 \pm 0.06$  for men, while 19.42% of the individuals presented high risk. Women presented an average WHR of  $0.78 \pm 0.06$ , while 11.91% presented high risk. The prevalence of high cardiovascular risk among all the participants, regardless of gender, was 17.24%. The average AC was  $92.51 \pm 10.01$  cm for men and  $82.35 \pm 9.08$  cm for women. High cardiovascular risk (46.9%) was verified among all the participants regardless of gender: 43.69% of men and 54.76% of women.

The overall TC average was  $182.88 \pm 30.49$  mg/dl, while 25.39% of the individuals were classified as "borderline" and 3.97% was classified as

"high". The average TG was  $154.19 \pm 71.14$  mg/dl, while 22.48% of the individuals presented borderline values and 20.16% presented high levels. No individuals were considered to have very high levels. The participants' overall average blood glucose was  $86.06 \pm 12.05$  mg/dl. A total of 3.45% of the individuals presented impaired fasting glucose and 1.38% of the individuals presented fasting plasma glucose values that suggest Diabetes Mellitus.

The average SBP and DBP were  $116.72 \pm 11.16$  mmHg and  $77.55 \pm 8.29$  mmHg, respectively. SBP by itself indicated that 46.89% of the individuals were in the prehypertension stage and 4.14% were in stage 1 of hypertension. No individuals were in stage 2 of hypertension. Taking DBP into account, 48.96% of the professors were classified as being pre-hypertensive, 13.1% as hypertensive stage 1, and 0.7% as hypertensive stage 2. Alterations both in SBP and DBP indicate that 19.31% of the individuals present prehypertension parameters and 16.55% present hypertension parameters. The descriptive analysis concerning the studied variables and comparison among variables according to gender is presented in Table 1.

Table 2 shows the descriptive analysis of the studied variables and comparisons according to age groups, regardless of sex. The variables that indicate cardiovascular risk, such as WHR, AC, TC, TG and SBP, increase in a statistically significant manner after the 50 years old.

Table 3 presents the Pearson's correlation matrix (r) for the sexes combined for all the variables analyzed. We note that BMI presented strong correlation with AC and moderate correlation with WHR and SBP. Additionally, moderate correlations were found between WHR and AC, between AC and SBP, and between SBP and DBP.

**Table 1.** Descriptive analysis of variables in the sample of professors at UFV and comparison according to sex

Variable	Men (n=103)		Women (n=42)		p-value
	Average	SD	Average	SD	
Age (years)	46.90	9.82	43.27	9.09	0.042
Weigh (Kg)	77.56	11.97	62.10	9.89	<0.001
Height (cm)	1.74	0.07	1.61	0.06	<0.001
BMI (Kg/m <sup>2</sup> )	25.57	3.54	24.11	3.65	0.027
WHR	0.89	0.06	0.78	0.06	<0.001
AC (cm)	92.51	10.01	82.35	9.08	<0.001
Glucose (mg/dl)	86.19	11.44	85.71	13.59	0.829
CT (mg/dl)	183.15	28.86	183.26	34.39	0.882
TG (mg/dl)	159.20	72.78	142.18	66.46	0.217
SBP (mmHg)	118.79	10.01	111.67	12.28	<0.001
DBP (mmHg)	78.64	7.80	74.88	8.94	0.013

**Table 2.** Descriptive analysis of variables studied in a sample of professors at UFV and comparison, according to age

Variable	Age groups (years)				
	20-30 (n=7)	31-40 (n=34)	41-50 (n=56)	51-60 (n=38)	> 60 (n=10)
Weigh (Kg)	69.44 ± 16.09	71.94 ± 11.32	70.68 ± 13.36	76.00 ± 12.18	81.82 ± 18.58
Height (m)	1.67 ± 0.15	1.71 ± 0.09	1.70 ± 0.08	1.71 ± 0.10	1.72 ± 0.05
BMI (Kg/m <sup>2</sup> )	24.91 ± 4.11	24.59 ± 2.92	24.44 ± 3.14	26.02 ± 3.24	27.83 ± 6.96
WHR	0.80 ± 0.06	0.85 ± 0.08	0.84 ± 0.08	0.89 ± 0.07**	0.92 ± 0.08**
AC (cm)	87.94 ± 8.61	87.46 ± 8.54	86.17 ± 10.27	93.77 ± 8.19‡	101.00 ± 17.54‡
Glucose (mg/dl)	82.10 ± 7.00	82.70 ± 6.60	85.80 ± 7.90	87.70 ± 14.90	95.00 ± 26.00
CT (mg/dl)	191.60 ± 31.50	178.20 ± 34.90	182.10 ± 30.40	191.90 ± 27.50†	163.10 ± 11.00‡§
TG (mg/dl)	175.60 ± 75.90	131.20 ± 49.80	144.50 ± 64.80	193.50 ± 86.80†‡	124.90 ± 40.10§
SBP(mmHg)	112.10 ± 17.50	115.00 ± 7.89	113.40 ± 10.80	121.90 ± 9.90†‡	124.50 ± 12.60†‡
DBP(mmHg)	73.60 ± 10.30	77.40 ± 6.50	76.40 ± 8.70	79.30 ± 8.90	80.50 ± 6.90

\* p-value < 0.05 in the comparison of the group between 20-30 years old; †P-value < 0.05 in the comparison of the group 31-40 years old; ‡ P-value < 0.05 in the comparison of the group between 41-50 years old; § P-value < 0.05 in the comparison of the group between 51-60 years old

**Table 3.** Pearson's correlation matrix (r) for the sexes combined

Variables	Age	BMI	WHR	AC	Gluc	TC	TG	SBP
BMI	0.21*							
WHR	0.32†	0.51†						
AC	0.33†	0.86†	0.67†					
Gluc	0.26†	0.22†	0.06	0.22†				
TC	0.01	0.11	0.01	0.08	-0.02			
TG	0.13	0.21*	0.20*	0.27†	0.09	0.12		
SBP	0.32†	0.52†	0.47†	0.57†	0.24†	0.04	0.22*	
DBP	0.16	0.36†	0.27†	0.38†	0.27†	0.10	0.23†	0.53†

\* P-value < 0.05 (Pearson test of correlation); † P-value < 0.01 (Pearson test of correlation)

## Discussion

A total of 46.89% of the participants were overweight, while 8.96% were obese. The results concerning being overweight are similar to those found by Cassani *et al.*<sup>3</sup> among individuals working for a soft drink company, where 46% of the individuals were overweight. Viebig *et al.*<sup>5</sup> also report that 47.5% of the individuals cared for in a general outpatient clinic located in the city of São Paulo, SP, Brazil were overweight. Even though this study's population presented an overweight prevalence compatible with national data, it still requires care be provided by health professionals, such as nurses, where educational actions and interventions are promoted so that those who are overweight do not progress to obesity. Discrepant values concerning obesity are, however, observed when results are compared with the studies conducted by Cassani *et al.*,<sup>3</sup> who reported a prevalence of 15%, and by Nunes Filho *et al.*,<sup>2</sup> who reported a prevalence of 15.6% in an adult population in the city of Luzena, SC, Brazil. These differences in relation to other national studies may be explained by regional characteristics such as eating habits,<sup>19</sup> educational levels,<sup>3</sup> and family income.<sup>3</sup> Therefore, the professors at UFV are at a lower cardiovascular risk, since BMI is an indicator of cardiovascular mortality in the long term.<sup>14</sup>

This study's results are similar to those found in the state of Minas Gerais, Brazil<sup>20</sup> where being overweight was observed in 37.1% of the individuals and obesity was observed in 8.7%, with a tendency for a greater prevalence of overweight cases. Moreira *et al.*<sup>9</sup> found a prevalence of 53% of being overweight/obesity among administrative technicians working at UFV. Moreira *et al.*<sup>10</sup> also found a prevalence of 46.3% of being overweight among professors and administrative technicians working at the Center for Agricultural Sciences at UFV. The average BMI of women was below the BMI of men, similar to the results reported in other studies.<sup>2,3</sup> A variation between sexes in terms of BMI is observed when these are compared among studies involving different population groups.<sup>5,7</sup> The higher BMI average found among men, may be explained by their larger amount of lean body mass, that is, it explains the higher body weight among these individuals.<sup>21</sup>

No statistical differences were found in regard to BMI behavior in the different age groups, however, BMI was associated with age ( $r=0.21$ ;  $p<0.05$ ), reinforcing the trend of weight gain after 50 years old. Cassani *et al.*<sup>3</sup> did not find differences in BMI for women in different age groups but found a tendency of increased BMI with aging. Increased

body fat and reduced lean body mass accompany the aging process due to genetic changes that accrue from this process,<sup>22</sup> reduced levels of physical activity, and changes in eating habits<sup>19</sup> that can affect BMI and, consequently, influence cardiovascular risk. The average WHR was 0.86, with a prevalence of 17.24% of the participants, who presented high cardiovascular risk. National studies show discrepant values for WHR.

Afonso and Sichieri<sup>23</sup> found that 48.8% of the women and 22% of the men in their study assessing residents of the city of Rio de Janeiro, RJ, Brazil, presented high cardiovascular risk because of their high WHR. Additionally, Cabrera *et al.*<sup>11</sup> also found higher values for WHR in women cared for in a geriatric outpatient clinic at the State University of Londrina, Brazil, the average value of which was 0.92. These results suggest that the professors at UFV presented less central obesity when compared to individuals of other regions of Brazil. Such a fact is important, especially because fat in the abdominal region is a predictor of cardiovascular disease and diabetes.<sup>24</sup> Similar results were found by Rezende *et al.*<sup>7</sup> in a population of college workers: women presented an average WHR of 0.89 and men presented an average of 0.87. Almeida, Almeida and Araújo<sup>8</sup> report an average value of 0.85, suggesting that the occupational activity of professors is by itself sedentary in nature. There are also certain geographic characteristics of the region explaining it. Viçosa is a city located in the mountainous region of Minas Gerais and has few flat areas, which, coupled with unplanned urbanization processes, do not provide areas appropriate for exercise. Additionally, behavioral characteristics like the practice of using cars to go to work may influence the deposition of fat in the abdominal region.

Differences were found for WHR, both between sexes and among age groups; higher values were found among individuals older than 50. Additionally, high WHR is associated with a higher number of hospitalizations<sup>23</sup> and increased mortality.<sup>11,16</sup> The average AC was 89.57 cm, with a prevalence of 46.9% of individuals with

high cardiovascular risk. A total of 58.95% of the individuals assessed in the metropolitan region of São Paulo, SP, Brazil presented increased AC.<sup>5</sup> Rezende *et al.*<sup>7</sup> report that 64.07% of the workers at UFV present increased AC. Such values are higher than those presented in this study.

Women presented lower AC than men. This result differs from the findings of Viebig *et al.*<sup>5</sup>, who observed an opposite trend, in which higher values were found among women, and also from results reported by Rezende *et al.*<sup>7</sup>, who did not find differences between sexes. AC was higher in individuals older than 50 years old, which is also a result reported by other studies.<sup>3,7</sup> Additionally, AC was associated with BMI ( $r=0.86$ ;  $p<0.01$ ) and with WHR ( $r=0.67$ ;  $p<0.01$ ), demonstrating that aging may affect the accumulation of abdominal fat, leading to increased cardiovascular risk. Excess abdominal fat, especially when associated with aging, predisposes individuals to a higher risk of stroke<sup>24</sup> and death.<sup>11,16</sup> It may also lead to losses in the social and intellectual spheres due to the need for individuals to be removed from their occupational activity, possibly leading to financial burden for the state since these are state university faculty members.

The average glucose level was 86.06 mg/dl, while 4.83% of the assessed individuals presented altered capillary glucose: 3.45% presented impaired fasting glucose and 1.38% presented fasting plasma glucose suggestive of Diabetes Mellitus. Similar values were found in other Brazilian cities: Belém, PA (5.1%), Curitiba, PR (4.9%), Florianópolis, SC (4.5%), Goiânia, GO (4.8%), Manaus, AM (4.5%), Natal, RN (4.5%), Porto Velho, RO (4.8%), Salvador, BA (4.7%), Vitória, ES (4.5%) and Brasília, DF (4.5%).<sup>20</sup>

Data from the Brazilian Society of Cardiology<sup>25</sup> reports incompatible values for glucose alterations in the Brazilian population, both for impaired fasting glucose (8%) and for fasting plasma glucose suggestive of Diabetes Mellitus (9%). Data from the Southeast only indicate 7.5% of impaired fasting glucose and 9.7% of fasting plasma glucose suggestive of Diabetes Mellitus.<sup>25</sup> These

values show that the glucose levels of professors are below those found in regional and national studies, meaning that this population group is at a lower risk of developing diabetic microangiopathy, coronary disease, nephropathy, and chronic hypertension.<sup>17</sup> Regional data are similar in a study conducted with a population from Teixeira, MG, Brazil cared for the Family Health Program: 5.79% of the individuals presented altered capillary glucose.<sup>12</sup> Because Diabetes Mellitus is an independent CRF, these findings reinforce the view that the faculty members at UFV are less exposed to cardiac risk when only glucose level is taken into account.

Borderline TC was observed in 25.39% of the individuals and high cholesterol was observed in 3.97%; the average total cholesterol was 182.88 mg/dl. The Brazilian Society of Cardiology reports national data for CRF, showing a prevalence of 21% in the Southeast, 21.5% in the Northeast, 24.3% in the South, and 20% in the North and Midwest. Cassani *et al.*<sup>3</sup> report inconsistent levels of altered lipid levels: 5% of the individuals in the borderline range and 1% with hypercholesterolemia; such results are less than those found in this study. An average TC of 205.98 mg/dl was found in a college population of individuals working for a public university in Bahia, Brazil,<sup>8</sup> while male workers from the UFV<sup>7</sup> presented 215.75 mg/dl and female workers presented an average of 201.66 mg/dl. Despite similarities in populations, the differences in the behavior of TC may be explained by the way the samples were selected: one study addressed apparently healthy professors, while the other addressed workers being cared for by a medical outpatient clinic at the UFV's health sector. Additionally, Moreira *et al.*<sup>9</sup> report 30.5% of individuals (administrative technicians at UFV) with high TC and Moreira *et al.*<sup>10</sup> report a prevalence of 42.7% in professors and administrative technicians at the Center for Agricultural sciences, UFV. Differences among the values found in this study and in other studies addressing college populations are perhaps due to methodological reasons, especially in relation to the use of self-reports.

The average TG was 154.19 mg/dl, classified as borderline, with 42.64% of the individuals presenting altered capillary levels of TG: 22.48% of these presented borderline values and 20.16% presented high values. The TG average values are similar to the average value of 159.61 mg/dl found in Colombian adults participating in a program to promote health and prevent cardiovascular diseases.<sup>26</sup> Monrreal *et al.*<sup>27</sup> assessed members of a Mexican college population and observed a 20% prevalence of high TG values among professors. Discrepant values, however, were found in Brazilian studies conducted by Viebig *et al.*,<sup>5</sup> who report a 11.5% of prevalence in the TG levels, and Cassani *et al.*<sup>3</sup> reporting 16% of TG prevalence. Rezende *et al.*<sup>7</sup> reported that an average TG of 108.5 mg/dl was found among women and an average TG of 144 mg/dl was found among men. These results reveal both a higher TG and a greater frequency of cases of altered TG in this sample. Dietary habits, daily level of exercise, and smoking habits may interfere in these parameters since there is a positive association between these factors and increased TG.<sup>28</sup>

Some anthropometric indicators show an association with TG, such as BMI ( $r=0.21$ ;  $p<0.05$ ), WHR ( $r=0.2$ ;  $p<0.05$ ), WHR ( $r=0.2$ ;  $p<0.05$ ), AC ( $r=0.27$ ;  $p<0.01$ ). This may be explained by the quantity of adipose tissue available in TG concentrations, since free fatty acids that are released from the adipose tissue through lipolysis are responsible for supplying energy for the body and for the re-esterification of TG.<sup>29</sup> Therefore, individuals with a greater quantity of adipose tissue are able to free more fatty acids and produce increased concentrations of TG in the blood, increasing the likelihood of this factor of influencing the genesis of cardiovascular diseases. In this case, clinical monitoring of individuals with high values of TG is recommended on the part of physicians and nurses in order to complement the behavior of this lipid component and lead to the best intervention.

The average SBP and DBP were 116.72 mmHg and 77.55 mmHg, respectively, which were considered to be within normal levels.<sup>18</sup> A total



of 19.31% of the individuals were considered pre-hypertensive and 16.55% were considered hypertensive. National data<sup>25</sup> indicate that hypertension (HA) affects 28.5% of Brazilians; its prevalence in the Southeast is 29.1%. Another national study assessing CRF in Brazilian capitals<sup>20</sup> shows that HA ranges from 15.1% (Palmas, TO) to 24.9% (Recife, PE). In Belo Horizonte, MG, HA affected 23.7% of the participants: 22.7% of the men and 24.5% of the women. Based on these findings, the professors assessed in this study present lower blood pressure levels when compared to the regional and national contexts. This result may have been influenced by the professors' higher educational level, reflected in improved self-care.<sup>4</sup>

Specifically at UFV, several studies addressing HA have been developed over the years and report that 23.2% of professors and administrative technicians<sup>10</sup> and 20.3% of administrative technicians are affected.<sup>9</sup> These figures show that there is a tendency of lower HA prevalence, perhaps a result of preventive measures and treatment of this disease on the UFV campus. Women experience significantly lower pressure levels when compared to men both in regard to SBP and DBP, which is a fact reported in the scientific literature.<sup>4</sup> Both sexes, however, presented blood pressure within normal levels, which is a positive factor for the prevention of cardiovascular disease.<sup>18</sup>

SBP increases with age, especially after the age of 50, which is in agreement with other studies.<sup>4</sup> The natural aging process experienced by the assessed professors calls for the adoption of preventive measures, such as increasing daily exercise, improving diet, and improving self-care in order to mitigate the naturally occurring increase in blood pressure. SBP showed positive association with BMI ( $r=0.52$ ;  $p<0.01$ ) and AC ( $r=0.57$ ;  $p<0.01$ ), suggesting that obesity, especially abdominal obesity, can influence pressure levels, contributing to increased cardiovascular risk. Such a result is corroborated by Jardim *et al.*<sup>4</sup> in a study conducted with residents of a state capital in Brazil and reported that individuals

with excess weight are 1.44 more likely to be affected by hypertension than their normal-weight counterparts. Moreira *et al.*<sup>30</sup> also found in a study with college professors that individuals with excess weight had a higher likelihood of experiencing hypertension (OR= 2.75; IC= 1.26 – 6.06;  $p<0.001$ ). Considering that the studied population presents a high prevalence of being overweight, measures to control and reduce body weight need to be adopted. Such measures should be based on regular exercise and nutritional orientation in order to prevent the development of being overweight/obese, which is an independent risk for coronary diseases that, when associated with hypertension, aggravates cardiovascular risk among professors at UFV.

The results show that some CRF display associations among themselves, such as BMI, AC, WHR, SBP, DBP, glucose and TG. Preventive and control measures intended to influence a given factor may indirectly reduce other factors that may be associated with the first. Therefore, the development and implementation of educational strategies and intervention protocols should be based on actions that influence more than one CRF with the objective to improve the application of human and material resources and maximize health benefits achieved through these interventions. Even though the professors assessed presented parameters consonant with national and state contexts, they still require monitoring to prevent a potential increase in this prevalence with a consequent increase in cardiac risks.

## Conclusion

The most prevalent cardiovascular risk factors observed in the population of faculty members were excess weight, accumulation of abdominal fat and hypertriglyceridemia. When compared to men, women are less exposed to risk factors, suggesting they are at a lower risk of developing cardiovascular disease. In regard to age, an increase in the exposure to risk factors as

individuals age was observed. Therefore, we suggest the adoption of control measures and the monitoring of existing cases on the part of the professionals involved in primary health care, such as nurses, physical educators, physicians, and nutritionists with the objective of preventing complications and also tracking and identifying new cases. Hence, we highlight the importance of health promotion policies and of the redirection of already existing policies so that these assume a preventive nature to reduce the incidence of risk factors of cardiovascular diseases. We believe that significant benefits, both social and economic, will be achieved in the long run by reducing the prevalence of modifiable risk factors present in this population.

This study has some limitations because other variables that may be associated with CRF such as ethnicity, socioeconomic profile, and the ingestion of sodium and fat, social behavior, leisure and sedentariness, were not taken into account. We note, however, the results are in agreement with data reported by various national studies.

## References

1. Souza MFM, Alencar AP, Malta DC, Moura L, Mansur AP. Análise de séries temporais da mortalidade por doenças isquêmicas do coração e cerebrovasculares, nas cinco regiões do Brasil, no período de 1981 a 2001. *Arq Bras Cardiol.* 2006; 87:735-40.
2. Nunes Filho JR, Debastiani D, Nunes AD, Peres KG. Prevalência de fatores de risco cardiovascular em adultos de Luzerda, Santa Catarina, 2006. *Arq Bras Cardiol.* 2007; 89(5):319-24.
3. Cassani RSL, Nobre F, Pazin Filho A, Schmidh A. Prevalência de fatores de risco cardiovascular em trabalhadores de uma indústria brasileira. *Arq Brasil Cardiol.* 2009; 92(1):16-22.
4. Jardim PCBV, Gondim MRP, Monego ET, Moreira HG, Vitorino PVO, Souza WKSP, et al. Hipertensão Arterial e Alguns Fatores de Risco em uma Capital Brasileira. *Arq Bras Cardiol.* 2007; 88(4):452-57.
5. Viebig RF, Valero MA, Araújo F, Yamada AT, Mansur AJ. Cardiovascular Health Profile of an Adult Population from the Metropolitan Region of São Paulo. *Arq Bras Cardiol.* 2006; 86(5):353-60.
6. Belkic K, Schnal P, Landbergis P. The workplace and cardiovascular health: conclusions and thoughts for a future agenda. *Occup Med.* 2000; 15:307-21.
7. Rezende FAC, Rosado LEFPF, Ribeiro RCL, Vidigal FC, Vasques ACJ, Bonard IS, et al. Índice de massa corporal e circunferência abdominal: associação com fatores de risco cardiovascular. *Arq Brasil Cardiol.* 2006; 87(6):728-34.
8. Almeida RT, Almeida MMG, Araújo TM. Obesidade abdominal e risco cardiovascular: desempenho de indicadores antropométricos em mulheres. *Arq Bras Cardiol.* 2009; 92(5):375-80.
9. Moreira OC, Oliveira CEP, Teodoro BG, Souza GC, Lizardo FB, Santos LA, et al. Fatores de risco de doença cardiovascular em técnicos administrativos da Universidade Federal de Viçosa. *Biosci J.* 2009; 25(5):133-40.
10. Moreira OC, Oliveira CEP, Marins JCB. Diagnóstico primário de fatores de risco coronarianos em professores e técnicos administrativos do Centro de Ciências Agrárias da UFV. *Lecturas Educ Fis Deporte.* 2008; 13(1):1-8.
11. Cabrera MAS, Majngarten M, Gebara OCE, Diamant J. Relação do índice de massa corporal, da relação cintura-quadril e da circunferência abdominal com a mortalidade em mulheres idosas: seguimento de 5 anos. *Cad Saúde Pública.* 2005; 21(3):767-75.
12. Fidelis LC, Moreira OC, Teodoro BG, Oliveira CEP. Prevalência de Diabetes Mellitus no município de Teixeira-MG. *Rev Bras Atividade Física & Saúde.* 2009; 14(1):23-7.
13. Lwanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. Geneva, World Health Organization; 1991.
14. World Health Organization. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health. *Obes Res.* 1998; 6(Supl2):51-209.
15. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser.* 2000; 894(i-xii):1-253.

16. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III): Final Report. NIH Publication No. 02-5215. Bethesda, MD: National Heart, Lung, and Blood Institute; 2002.
17. American Diabetes Association (ADA). Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*. 2003; 21(S1):S5-S20.
18. Sociedade Brasileira de Cardiologia. V Diretrizes brasileiras de hipertensão. *Arq Bras Cardiol*. 2007; 89(3):e24-e79.
19. Leyna GH, Mmbaga EJ, Mnyika KS, Hussain A, Klepp KI. Food insecurity is associated with food consumption patterns and anthropometric measures but not serum micronutrient levels in adults in rural Tanzania. *Public Health Nutr*. 2010; 3:1-7.
20. Brasil, Ministério da Saúde. Secretaria de Vigilância em Saúde. Secretaria de Gestão Estratégica e Participativa. *Vigitel Brasil 2006: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico*. Brasília: Ministério da Saúde. 2007.
21. Van Geel TA, Geusens PP, Winkens B, Sels JP, Dinant GJ. Measures of bioavailable serum testosterone and estradiol and their relationships with muscle mass, muscle strength and bone mineral density in postmenopausal women: a cross-sectional study. *Eur J Endocrinol*. 2009; 160(4):681-87.
22. Hjelmborg JV, Fagnani C, Silventoinen K, McGue M, Korkeila M, Christensen K, et al. Genetic influences on growth traits of BMI: a longitudinal study of adult twins. *Obesity*. 2008; 16(4):847-52.
23. Afonso FM, Sichieri, R. Associação do índice de massa corporal e da relação cintura/ quadril com hospitalizações em adultos do Município do Rio de Janeiro, RJ. *Rev Bras Epidemiol*. 2002; 5(2):153-63.
24. Lapice E, Maione S, Patti L, Cipriano P, Rivelesse AA, Riccardi G, et al. Abdominal adiposity is associated with elevated C-reactive protein independent of BMI in healthy nonobese people. *Diabetes Care*. 2009; 32(9):734-36.
25. Neto RMN. *Atlas Corações do Brasil*. São Paulo:Sociedade Brasileira de Cardiologia; 2005.
26. Duque SL, Vásquez J. Riesgo cardiovascular, calidad de vida y años de vida ajustados por calidad: un estudio de caso. *Invest Educ Enferm*. 2010; 28(1):32-42.
27. Magallanes M, Gallegos CEC, Carrillo CAL, Sifuentes LD, Olvera BMA. Sobrepeso, obesidad y dislipidemias en población universitaria del noreste de México. *Invest Educ Enferm*. 2010; 28(1):101-7.
28. Woolf K, Reese CE, Mason MP, Beard LC, Tudor-Locke C, Vaughan LA. Physical activity is associated with risk factors for chronic disease across adult women's life cycle. *J Am Diet Assoc*. 2008; 108(6):948-59.
29. Warensjö E, Rosell M, Hellenius M, Vessby B, Faire UD, Risérus U. Associations between estimated fatty acid desaturase activities in serum lipids and adipose tissue in humans: links to obesity and insulin resistance. *Lipids Health Dis*. 2009; 8:37-42.
30. Moreira OC, Oliveira RA, Andrade Neto F, Amorim W, Oliveira CEP, Doimo LA, et al. Associação entre risco cardiovascular e hipertensão arterial em professores universitários. *Rev Bras Educ Fís Esporte*. 2011; 25:397-406.