

Original article (short paper)

Prevalence of coronary heart disease risk factors in physical education students

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Abstract—To establish the prevalence of coronary risk in physical education students, and compare risk between the genders and the years of course. We evaluated 246 physical education students using RISKQ questionnaire to determine eight risk factors: age, heredity, body weight, smoking, physical inactivity, hypercholesterolemia, hypertension and sex. Students had mean coronary risk score of 16.03 ± 3.52 points, rated “below-average risk.” Men had significantly greater risk compared to women. No difference was found between the years of course. The prevalence of risk factors were heritability (58.37%), physical inactivity (32.65%), hypercholesterolemia (32.24%), overweight (27.35%), smoking (3.67%) and hypertension (2.45%). The coronary risk of physical education students was rated as below average, being higher among men than women, and no difference in risk between years of course. The most prevalent risk factors were heredity, physical inactivity, overweight and hypercholesterolemia.

Keywords: health, epidemiology, cardiovascular disease, primary attention

Resumo—“Prevalência de fatores de risco de doença coronariana em estudantes de educação física.” Estabelecer a prevalência de risco coronariano em estudantes de educação física, e comparar o risco entre os gêneros e os anos de curso. 246 estudantes de educação física foram avaliados por questionário RiskQ, que avalia oito fatores de risco: idade, hereditariedade, peso corporal, tabagismo, inatividade física, hipercolesterolemia, hipertensão e sexo. Os alunos tiveram média do escore de risco coronariano de $16,03 \pm 3,52$ pontos, classificados como “de risco abaixo da média.” Os homens tiveram risco significativamente maior em comparação com as mulheres. Não foram encontradas diferenças entre os anos de curso. A prevalência de fatores de risco foram herdabilidade (58,37%), inatividade física (32,65%), hipercolesterolemia (32,24%), sobrepeso (27,35%), fumo (3,67%) e hipertensão arterial (2,45%). O risco coronariano de estudantes de educação física foi classificada como abaixo da média, sendo maior entre os homens do que as mulheres, e não houve diferença no risco entre os anos de curso. Os fatores de risco mais prevalentes foram hereditariedade, sedentarismo, excesso de peso e hipercolesterolemia.

Palavras-chave: saúde, epidemiologia, doenças cardiovasculares, atenção primária

Resumen—“Prevalencia de factores de riesgo de enfermedad coronaria en los estudiantes de educación física.” Establecer la prevalencia del riesgo cardiovascular en estudiantes de educación física y comparar el riesgo entre los géneros y los años del curso. 246 estudiantes de educación física fueron evaluados por el cuestionario RISKQ, que valora ocho factores de riesgo: edad, hereditadidad, peso corporal, tabaquismo, inactividad física, hipercolesterolemia, hipertensión arterial y sexo. El promedio de riesgo cardiovascular de los estudioantes fue 16.03 ± 3.52 puntos, clasificado como “riesgo bajo el promedio.” Los hombres presentaron riesgo significativamente más grande que las mujeres. No

fueron encontradas diferencias en el riesgo para los años del curso. Los factores de riesgo más prevalentes fueron hereditariadad (58,37%), inactividad física (32,65%), hipercolesterolemia (32,24%), sobrepeso (27,35%), tabaquismo (3,67%) y hipertensión arterial (2,45%). El riesgo cardiovascular de los estudiantes de educación física fue clasificado como bajo el promedio, presentandose más elevado en los hombres y sin diferencias entre los años del curso. Los factores más prevalentes fueron hereditariadad, inactividad física, sobrepeso y hipercolesterolemia.

Palabras claves: salud, epidemiología, enfermedades cardiovasculares, la atención primaria

Introduction

Chronic Non-Communicable Diseases (NCDs) are a major public health concern, representing a substantial portion of the expenses of the Health System and the Supplementary Health System (MHB, 2012). Estimates from the World Health Organization show that NCDs account for 63% of all 36 million deaths worldwide in 2008 (WHO, 2011). In Brazil, the NCDs are also important, accounting for 31.3% of deaths from cardiovascular disease and 72% of total deaths in 2007 (Schmidt *et al.*, 2011). Historical mortality statistics available for the Brazilian state capitals indicate that the proportion of deaths from NCDs increased more than threefold between 1930 and 2006 (Malta *et al.*, 2006).

Cardiovascular disease (CVD) is the NCD that stands out among all chronic degenerative diseases. CVD includes coronary atherosclerosis, strokes, hypertension and its complications, and is the largest cause of death in adults (Haskell *et al.*, 2007).

According to the Ministry of health (MHB, 2009), 32% of all deaths in Brazil are a result of CVD, which is the highest rate of death from cerebrovascular diseases among American countries. Still, considering all age groups, CVD, especially coronary artery disease, cerebrovascular disease and heart failure, account for the highest number of deaths (Silva *et al.*, 2005; Viebig *et al.*, 2006).

Among the risk factors for CVD are overweight/obesity, physical inactivity, hypertension, smoking, diabetes mellitus, and dyslipidemia, whose prevalence depend on genetic and environmental characteristics and is influenced by lifestyle habits such as diet and the level of habitual physical activity (Hjelmborg *et al.*, 2008).

Epidemiological studies with college students, found low prevalence of CVD risk factors among this population, but data showed the need to turn our attention to this population, considering that individuals with high risk can develop CVD early in life (Coelho *et al.*, 2005; Fisberg *et al.*, 2001; Hazar *et al.*, 2011; Moreira *et al.*, 2011; Rabelo *et al.*, 1999). In addition, those studies show that men have higher cardiovascular risk compared to women. Physical education students undergo physical strain during practical classes, making it necessary to establish coronary risk in this population during medical evaluation before participation. The identification of risk factors would reduce the probability of occurrence of cardiovascular events during practical classes (Hazar *et al.*, 2011).

In this sense, the determination of the prevalence of risk factors in a given population stratum, such as physical education students, gains importance by measuring the primary risk, a fact that could potentially contribute to the reduction of cardiovascular events in these students during practical classes. Further benefit is gained if this risk reduction can be used by the public health system and private pension companies to gain subsidies for the establishment of effective health promotion programs (Hazar *et al.*, 2011).

Given the above, the present study aimed to establish the prevalence of coronary risk factors in physical education students in general, and to more specifically compare the coronary risk between the genders and levels of education.

Methods

We conducted an observational cross-sectional study, in 2013, in a representative sample of the population of students in physical education, Federal University of Viçosa, Campus Viçosa (UFV), which is located in Viçosa, Zone location Mata, the state of Minas Gerais. The study was conducted in three phases: 1) Approval of the project by the Ethics Committee for Research in Humans (reference number 187/2011/ Ethics Committee) and the research project at the Federal University of Viçosa record; 2) Participant recruitment, and explanation of the research, data collection procedures, and risks associated with study participation; 3) Individual application of questionnaires to all selected.

The sample size was calculated according to the equation proposed by Lwanga and Lemeshow (1991). A minimum sample of 158 individuals was required, considering the total number of students of the institution (332 students) and a standard error of 5%, with a confidence interval of 98%. Considering the possibility of losses and refusals, the sample size was increased by 20%, seeking assurance that the minimum subject number was achieved. Accordingly, the minimum sample size required was 190 individuals.

Two hundred and forty six students were randomly selected from all years of the physical education program of study, which corresponds to 74.10% of all physical education students. The selection was made through a list in which students were organized according to their registration numbers on an Excel for Windows spreadsheet: a random drawing was performed without repeating the participants. The 246 students were selected,

evaluated, and divided into subgroups of the first to the fifth year of the course for purposes of comparison. As inclusion criteria, all participants were regularly enrolled at UFV, belonged to the physical education course and signed the consent form. All data collection procedures met the Guidelines and Standards Regulating Research Involving Human Subjects (Resolution 466/12 of the National Health Council).

To collect data, we used the Risko questionnaire proposed by the Michigan Heart Association (MHA) (MHA, 1973). The form of the questionnaire followed the pattern used in other studies in Brazil (Hazar *et al.*, 2010; Moreira *et al.*, 2009; Moreira *et al.*, 2006; Moreira *et al.*, 2011). This questionnaire assesses eight risk factors, namely: age, heredity, body weight, smoking, physical inactivity, hypercholesterolemia, hypertension and gender. Each risk factor has six response options, and every response is equivalent to a score that represents the entry for that coronary risk factor. The sum of the scores obtained from the responses to the eight risk factors corresponds to a score that represents the coronary risk. This coronary risk score is rated through a table formulated by MHA (MHA, 1973), which evaluates the individual as “well below average” for scores lower than 11 points; “below average” for scores between 12 and 17 points; “medium risk,” for scores between 18 and 24 points; “moderate risk” for scores between 25 and 31 points; “high risk,” for scores between 32 and 40 points; and “very high risk” for scores of more than 41 points.

The questionnaire was administered individually by a single evaluator. The participants completed the questionnaire with the least possible interference from the evaluator. All questions were answered by self-report. Therefore, all results in weight, exercise, cholesterol, blood pressure were derived from self-reported data.

The following criteria for consideration of risk factors as were used: age greater than or equal to 40 (Moreira *et al.*, 2011); heredity, having at least 1 first-degree relative with cardiovascular disease in the family (Moreira *et al.*, 2009); body mass, being more than three pounds overweight according to standardized scales (Hazar *et al.*, 2010); smoking, daily, weekly or monthly for the last twelve months (Rodríguez, Pineda, & Vélez, 2010);

sedentary lifestyle, not participating in moderate or intense recreational exertion (ACSM, 2011); cholesterol above 200 mg / dl (Stone *et al.*, 2013); and systolic blood pressure greater than or equal to 140 mmHg blood pressure (BSC, 2010).

Statistics

Data were stored in Excel® 2003 and analyzed in Sigma Stat for Windows version 2.06 and Epi Info version 7 programs. Data were analyzed using the Kolmogorov-Smirnov test. Data are presented as mean \pm standard deviation. The Student t test was used to compare coronary risk between gender. We used the one-way ANOVA test with Tukey *post hoc* comparison to compare coronary risk among students of different years of study. A significance level of $p < .05$ was adopted for all comparisons. Moreover, there was the chi-square (χ^2) test to check for differences in the prevalence of each risk factor by gender.

Results

One hundred and one males and 145 females were studied. The mean age of the sample was 22.26 ± 2.93 years (range: 18-34 years). The men had a mean age of 21.77 ± 2.40 years and women 22.59 ± 3.20 years.

The average coronary risk score for all participants was 16.03 ± 3.52 points (range: 9-29 points). Men scored higher ($p < .001$), with a mean score of 17.54 ± 2.64 points (range 11-29 points). Women had a mean score of 14.96 ± 3.66 points (range 9-28 points). The score obtained in the whole sample (men and women) fell within the category of “below-average risk,” according to the classification of MHA (MHA, 1973).

The mean scores for coronary risk of the sample, segmented by year of study and gender, are presented in Table 1. Participants in the first, second, fourth and fifth years of the physical education program of study were classified as “below average.” Participants in the third year of study had rating of “medium risk.”

Table 1. Comparison of coronary risk scores by year of study and gender.

Variable	Average	Standard Deviation	Minimum	Maximum	F	p-value
Total	16.03	3.52	9	29		
Gender					13.29*	< .001
Female	15.97	4.12	9	28		
Male	17.54	2.63	11	29		
Year course					4.90†	< .001
1°	15.88	3.71	11	21		
2°	14.62	2.72	9	18		
3°	17.18	4.04	9	28		
4°	15.81	2.95	11	21		
5°	16.91	3.81	10	29		

*: t de student; †: F de Snedecor

The percentage distribution of coronary risk in participants, total and by gender, lies in detail in Table 2. Men had more than twice the risk of women.

Table 2. Distribution of coronary risk. Table 2. Distribution of coronary risk.

Risk rating	Total (%) (n=246)	Male (%) (n=101)	Female (%) (n=145)
Much below average	8.98	3.96	12.41
Below average	58.78	49.50	65.52
Average	30.61	45.54	20.00
Moderate	1.63	0.99	2.07

The prevalence of each coronary risk factor is presented in Table 3. The six predictor variables that were most prevalent in the responses to the questionnaire were heredity, sedentary lifestyle, hypercholesterolemia, obesity, smoking and hypertension, respectively.

Women showed higher prevalence of risk factors and hereditary hypercholesterolemia. Men had higher prevalence rates for risk factors of sedentary lifestyle, smoking and hypertension. No differences were found between genders for the overweight risk factor.

Table 3. Prevalence of coronary risk factors by gender.

Risk factor	Total	Male	Female	χ^2	p value
Heredity	58.37	47.52	65.52	7.85	.005
Sedentary	32.65	42.57	25.52	7.81	.005
Hypercholesterolemia	32.24	22.77	38.62	6.79	.009
Overweight	27.35	28.71	26.21	0.14	.71
Smoking	3.67	7.92	0.69	8.52	.004
Hypertension	2.45	5.94	0.00	8.38	.004

Discussion

The data from the current study indicate a “below average risk” (16.03 ± 3.52 points) according to MHA for this sample of physical education students (MHA, 1973). This finding, coupled with the fact that less than 2% of the assessed had “moderate risk” and that no cases of “high risk” and “very high risk” were observed, can be considered a positive and beneficial finding. In other studies conducted in college students (Moreira *et al.*, 2011) and physical education students (Hazar *et al.*, 2010), risk scores of 17.5 ± 4.59 and 16.3 ± 3.74 points and prevalence of almost 10% and 3.45% (moderate risk), respectively were reported.

Despite the low risk in the students assessed, attention is still required because they have relatively low average age and the presence of cases of moderate risk indicates the need to adopt a healthy lifestyle because one of the deleterious effects of aging is increased cardiovascular risk (Sjöström, Lystig, & Lindroos, 2011).

The coronary risk score of the sample was higher in men compared to women ($p < .001$). This is similar to that observed in the literature (Coelho *et al.*, 2005; Hazar *et al.*, 2010; Moreira *et al.*, 2011). The protection against coronary risk in women may be explained by many factors: better vascular endothelial function, increased levels of endothelial progenitor cells that participate in the repair of vascular lesions, better autonomic function, and

female sex hormones that all delay the formation of atherogenic plaque (Vaccarino *et al.*, 2011).

The most prevalent risk factor was heredity, with 58.37% of the sample having at least 1 first degree family member with cardiovascular disease. Similar findings were reported in physical education students of the Federal University of Viçosa, with 63.3% prevalence (Moreira *et al.*, 2011). In another study in college students in the area of health Recife / PE were reported to have 66.4% prevalence (Petribu, Cabral, & Arruda, 2009). Furthermore, physical therapy students had a prevalence of 63.54% (Correia, Santos, & Cavalcante, 2010). It is noteworthy that the family history of cardiovascular risk is a powerful and independent risk factor associated with acute myocardial infarction (Haskell *et al.*, 2007), which has no modifiable characteristic, so is necessary to adopt measures to achieve the lowest risk from other risk factors that can be modified to help prevent coronary artery disease.

The second most prevalent risk factor was physical inactivity, which was present in 32.65% of the sample. National data indicate that the prevalence of physical inactivity in Brazil, adding individuals who report physical inactivity together with those who have insufficient levels of physical activity, ranges between 56.90% and 72.10% (MHB, 2012). Specifically for college students, some studies found a prevalence of 41.70% for sedentary lifestyle in college students in the health area of Recife / PE (Correia *et al.*, 2010); 44.44% in physical therapy students (Jorgensen *et al.*, 2009); 43.10% in medical students of São José do Rio Preto / SP (Coelho *et al.*, 2005); and 24.14% in physical education students (Hazar *et al.*, 2010). The prevalence of physical inactivity in the current study participants was less than that of other studies. This finding should be viewed as beneficial because a sedentary lifestyle is associated with the development of NCDs and levels of physical activity have a dose-response effect on various health indicators (Jorgensen *et al.*, 2009).

However, in the case of physical education students, even though the prevalence of physical inactivity is below the national average, the numbers found can be considered high, since it was expected that this group was physically active because they know the benefits of regular physical exercise.

Hypercholesterolemia was reported in 32.24% of the sample, placing this risk factor third in prevalence of the measured risk factors. Similar prevalence has been reported by Hazar *et al.* (2010), with 32.41% prevalence in physical education students (Moreira & Marins, 2006), with 32.9% prevalence in academics, with 30.1% prevalence in medical students (Coelho *et al.*, 2005); and 30.5% prevalence in administrative staff of UFV (Moreira *et al.*, 2009). Although the current data are in agreement with the cited studies, the prevalence of hypercholesterolemia is noteworthy because it is a young population with a mean age of 22.26 ± 2.93 years. It is known that higher concentrations of total cholesterol are associated with increased low density lipoproteins, which are related to the increased incidence of CVD, particularly when these atherogenic lipoproteins are oxidized (Noda *et al.*, 2010).

The risk factor of excess weight was prevalent in 27.35% of the sample. National data show that the frequency of adult overweight varies between 45.3% and 56.3% (MHB, 2012). Specifically for college students, some studies conducted in

Brazil, have found the prevalence of excess weight (overweight and obesity) to be between 18.02% and 38.10% (Correia *et al.*, 2010; Hazar *et al.*, 2010; Moreira *et al.*, 2011). Despite the prevalence of overweight in the sample being within the range found in other studies on college students, it is necessary to consider that this is a sample of university students who are studying physical education. Thus, it was expected that this prevalence would be lower compared to other studies of the general college population. The relatively high incidence of overweight in the current study sample may be related to overeating (energy intake) relative to energy expenditure, leading to a positive energy balance (Shool, Hand, & Blair, 2014). This finding is of concern because excess weight is associated with increased overall morbidity and mortality, due to coronary heart disease and stroke, among other diseases (Moreira *et al.*, 2009).

The risk factor of smoking was present in 4.1% of the sample. In Brazil, the Ministry of Health estimates that approximately 18.8% of the population are smokers (22.7% of men and 16% women) (MHB, 2012). Studies on college students, suggest the prevalence rates of smoking of 5.52% (Hazar *et al.*, 2010), 14.40% (Rodrigues *et al.*, 2010) and 14.65% (Moreira *et al.*, 2011). Despite the smoking rates in the current study being below the national average, and below the values reported in other studies of college students, this risk factor deserves attention because smoking is a powerful CVD risk factor and acts synergistically with other coronary risk factors to greatly increase the level of risk and the likelihood of death (Zheng *et al.*, 2014).

In this sense, the development of strategies for pre-participation evaluation and prevention of coronary risk should, focus mainly on overweight, hypercholesterolemia, and sedentary lifestyle because these risk factors were the most prevalent in the physical education students studied. This may lead to programs that reduce the probability of future occurrence of cardiovascular events in these students who may be at elevated risk during times of significant physical demand, such as in practical physical education classes (Hazar *et al.*, 2010). Moreover, an intervention to reduce these risk factors will also prevent the development of other risk factors such as hypertension.

There are limitations with questionnaires as data collection instruments. However, the questionnaires constitute a quick and low cost method of assessment strategy, and can aid in determining the level of cardiovascular risk and physical health of the participants. Questionnaires are particularly valuable when there is no impossibility of conducting clinical consultations.

Conclusion

From the results of this study it can be concluded that the coronary risk presented by the evaluated students of physical education is rated as below average. This risk is greater in men and is not related to the year of the study. Moreover, in isolation, the coronary risk factors most prevalent were heredity, sedentary lifestyle, hypercholesterolemia and overweight.

Despite the small percentage of risk presented, it is interesting that there was the presence of moderate risk in some of these students who will be professionals involved in primary health care.

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