Original Article

Lipid Profile and Risk Factors for Cardiovascular Diseases in Medicine Students

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Objective

To analyze the lipid profile and its correlation with risk factors for cardiovascular diseases (CVD) among medicine students.

Methods

We assessed 153 students, regardless of sex, with age between 18 and 31 years old, submitted to lipid profile analysis, including serum levels of total cholesterol (TC), fraction of cholesterol of low (LDLc), high (HDLc) and very low density (VLDLc) lipoproteins and triglycerides (TG), besides of life habits and anthropometric data. Statistic analysis was employed, including the test of Mann Whitney, chi-square test, Pearson's correlation and multivariate analysis, by adopting a significance level for a value of $p<0.05$.

Results

Sedentary lifestyle (43.1%) and familial history for CVD, particularly hypertension (74.5%), were distinguished. The lipid profile showed desirable, although altered levels of TC, LDLc and TG were detected in 11.8%, 9.8% and 8.5% from the students, respectively, and reduced levels of HDLc in 12.4% of them. Women showed significantly reduced values for LDLc and high values for HDLc compared to men's ($p=0.031$ and $p<0.0001$, respectively). There was a significant association between lipid profile and, preferably, body mass index (BMI), sedentary lifestyle, ingestion of alcohol, contraceptive use, familial antecedents of cerebrovascular accident and dyslipidemia.

Conclusion

Familial history for CVD, sedentary lifestyle and contraceptive use among medicine students showed frequent and associated to the lipid profile, as well as ingestion of alcohol and BMI. Although with desirable lipid profile, regardless of sex, higher levels of LDLc and reduced levels of HDLc in male sex provide a disadvantage to men compared to women.

Key words

lipid, medicine students, cardiovascular diseases

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Received for publishing on: 09/28/2004
Accepted on: 02/09/2005

Dyslipidemias are characterized by disorders in the levels of circulating lipids with our without repercussion of the vascular territory, associated to many clinical manifestations[1]. They can be influenced by genetic and/or acquired disorders. Among the environmental variables involved in determining the lipid profile, smoking, sedentary lifestyle and diet[2] are included. Excessive caloric ingestion, with high rate of fat and cholesterol, is associated to increased serum levels of total cholesterol (CT) and fraction cholesterol of low-density lipoprotein (LDLc)[3,4]. Among adults, the increased concentration of TC and diminished fraction of high-density lipoprotein (HDLc) cholesterol, hypertension, smoking, diabetes and obesity are associated to advanced atherosclerosis lesions and a greater risk of clinical manifestations of atherosclerotic disease[5]. There are also other factors involved, but non-controllable. Those are age[6], sex[7], race and heredity[8].

With a slow progression, atherosclerosis begins at childhood and characterizes for the formation of atheromas (lipid deposits on the intimal coat of arteries) that cause the restriction of blood flow. The narrowing of the vessel's lumen may lead to obstruction[9] and the appearance of its clinical manifestations, such as myocardial infarction, cerebrovascular accident and peripheral vascular disease[10]. High levels of serum cholesterol are associated with early atherosclerosis in adolescents and young adults[11]. Necropsy studies showed a high prevalence of atherosclerotic lesions in individuals between 2 and 39 years old and evinced the influence of risk factors on the formation of atheromatous plaque[12-14].

In Brazil, the studies aiming at the analysis of lipid profile and risk factors for cardiovascular diseases among the young population are scarce. This study aimed at analyzing the lipid profile of students from the Medicine Course at Faculdade de Medicina de São José do Rio Preto, SP-FAMERP, and verify its relationship with the risk factors for cardiovascular diseases identified in the studied group.

Methods

All students from Faculdade de Medicina de São José do Rio Preto, SP – FAMERP, enrolled in Medicine Course, from the 1st to the 6th year in the year 2003, were informed and invited to participate in this study. After giving a written informed consent, 153 students, from a total of 380, were assessed, regardless of sex, with age ranging between 18 and 31 years old.

The analyzed variables were age, anthropometric measurements (weight and height), serum levels of TC, HDLc, LDLc and triglycerides (TG). The lipid profile was analyzed in accordance to

the criteria proposed by Sociedade Brasileira de Cardiologia (Brazilian Society of Cardiology)[15]; feast glycemia (complying with the standards of Expert Committee on the Diagnosis and Classification of Diabetes Mellitus)[16]; familial history (the presence of relatives with coronary artery disease (CAD) was regarded as positive) cerebrovascular disease (CVA), dyslipidemia, diabetes mellitus (DM) and hypertension (SH), regardless of the age of the event; body mass index [BMI = weight (kg)/height (m)^2], analyzed in accordance to the recommendations from WHO[17]; frequency in the ingestion of meat (bovine, pork, chicken and fish), fried food, vegetable and the use of animal and vegetal fat; sedentary lifestyle (those who did physical exercise, at least 3 times a week, with a minimum length of 45 minutes per session were regarded as non-sedentary); alcohol consumption and smoking.

Data related to age, familial history, alimentary consumption, sedentary lifestyle, alcohol consumption, smoking and other information, were obtained through the use of questionnaire. Weight and height were measured, respectively, on a mechanical scale and anthropometer, with students shoeless and wearing light clothes. The blood test was carried out by ward professionals. The students went of a 12-hour feast, did not do physical exercise nor consumed alcoholic beverages 24 hours prior to the test. Approximately 10 ml of blood were collected through venous puncture, for the biochemical dosage of TC, LDLc, HDLc, TG and glycemia. Blood samples were processed and the serum (for TC, TG, LDLc and HDLc) and plasma (for glycemia) were analyzed in a clinical analysis laboratory. The serum levels of TC, HDLc and TG, and plasmatic levels of glycemia were determined through an enzymatic colorimetric method[17,18]. TG levels were photometrically analyzed after enzymatic reaction, similar to the one used for TC CT, which originates a red-colored pigment, directly proportional to TG concentration. The levels of LDLc were estimated for TG values lower than 400 mg/dl by using Friedewald's formula: LDL = TC-(HDL-TG/5)[19].

The collected data were analyzed considering the prevalence of isolated or associated risk factors. Average values and standard deviations for continuous variables were calculated with Gaussian distribution. In the other variables the variation of percentiles in median was used. The t-test and the Mann-Whitney's test were performed for the comparison of means and medians, respectively. The analysis of the main components through the matrix of correlation of the variables TC, LDLc, HDLc, VLDLc and TG was carried out, determining hierarchized factors in accordance to their influence in the total variation. Those factors were confronted with risk factors for CVD, explaining their relationship with the lipid profile. The variables of age weight, height and BMI were compared with the Factors 1, 2, 3 through the correlation coefficient of Pearson. An α error of 5% was allowed.

Results

From the 153 assessed students, 74 (48.4%) were male and 79 (51.6%) female, with an age ranging from 18 to 31 years old (median=22 years old).

Among the analyzed risk factors, sedentary lifestyle prevailed in 66 (43.1%) individuals, followed by smoking in 9 (5.9%), whereas 8 (5.2%) referred consuming alcoholic beverages two or more times a week (tab. I). Obesity was detected in only 4 (2.6%) individuals, whereas 23 (15%) of them showed overweight. Forty (50.6%) of women confirmed the use of contraceptive methods. Regarding familial history, SH was distinguished, being reported by 114 (74.5%) subjects, followed by DM (n=73; 47.7%; tab. I). The referred variables showed non-significant differences when compared between sexes.

Concerning the diet, 61.4% (n=94) from the students referred to a greater ingestion of red meat (bovine and pork) to the detriment of white meat (chicken and fish). Among the students, 85 (55.6%) and 120 (78.4%) confirmed medium or frequent ingestion of fried food and vegetables or green vegetables, respectively.

Lipid profile, according to sex, is shown on table II. Women showed significantly reduced median values of LDLc (83 mg/dl) and increased median values of HDLc (60 mg/dl), when compared to men (92; 46 mg/dl; p value=0.031; p value<0.0001, respectively). Among the students, over 80% of them showed desirable levels for lipid profile. There was a similarity between sexes for all variables, except concerning HDLc, whose percentage of men with reduced levels (n=15) was significantly greater than the women (n=4; p value=0.006).

The multivariate analysis carried out through the test of main components, aiming at determining the association among the variables, showed the Factor 1, which included levels of TC, LDLc, VLDLc and TG, selecting individuals with high or low levels

Table I - Distribution of risk factors for cardiovascular diseases in medicine students, according to sex

Risk factors	Female sex		Male sex		Total		P value
	Nº	%	Nº	%	Nº	%	
Sedentary lifestyle	38	48.1	28	37.8	66	43.1	0.264
Obesity	3	3.8	1	1.4	4	2.6	0.621
Smoking	4	5.1	5	6.8	9	5.9	0.740
Alcohol ingestion	2	2.5	6	8.1	8	5.2	0.157
FH of CAD	29	36.7	27	36.5	56	36.6	1.000
HF of CVA	20	25.3	21	28.4	41	26.8	0.717
HF of dyslipidemia	27	34.2	21	28.4	48	31.4	0.488
HF of SH	61	77.2	53	71.6	114	74.5	0.462
HF of DM	38	48.1	35	47.3	73	47.7	1.000

FH - familial history; CAD - coronary artery disease; CVA - cerebrovascular accident; SH - systemic hypertension; DM - diabetes mellitus.

Table II - Median values for lipid profile, according to sex

Lipid Profile (mg/dl)	Female (N=79)	Male (N=74)	Total (N=153)	P value
Total cholesterol				
Median	164	155	162	
Min-Max	110-244	91-213	91-244	0.19
HDLc				
Mediana	60	46	51	
Min-Max	28-100	28-85	28-100	<0.0001
LDLc				
Median	83	92	87	
Min-Max	54-167	38-144	38-167	0.031
VLDLc				
Median	16	17	16	
Min-Max	7-79	8-46	7-79	085
Triglycerides				
Median	82	84	82	
Min-Max	36-394	39-231	36-394	0.85

LDLc - fraction of cholesterol of low-density lipoprotein; HDLc - fraction of cholesterol of high-density lipoprotein; VLDLc - fraction of cholesterol of very low density lipoprotein.

for those variables altogether, being responsible for 48.7% from total variation of lipid profile among the individuals. The Factor 2 explained 29.0% from total variation, identifying individuals with high levels of TC, HDLc and LDLc and reduced levels of VLDLc and TG or vice-versa. The Factor 3 explained 22.3% from the total variation of lipid profile and identified individuals with increased levels of LDLc and reduced levels of HDLc or vice-versa.

The Factors 1, 2 and 3 were related to age, weight, height and BMI, through Pearson's correlation. Figure 1 shows the level of correlation among the referred variables with the respective factors. Values with significant positive correlation of 0.263 and 0.168 between Factor 1 and age (p value=0.001) and Factor 1 and BMI (p value=0.038), respectively (fig. 1A) are observed. That demonstrates that the increase of the value for Factor 1, identified through the increase in the concentration of TC, LDLc, VLDLc and TG, was associated to the increase of age and BMI of the individuals. Factor 2 showed a significantly positive correlation with weight (0.197; p value=0.014), height (0.164; p value=0.043) and BMI (0.160; p value=0.048) (fig. 1B). In this case, the increase of Factor 2, identified through the increase of the levels of TG and VLDLc and decrease in the levels of TC, LDLc and HDLc, was associated to a higher values of weight, height and BMI. Factor 3 showed a significantly negative correlation with weight (-0.461; p value<0,0001), height (-0.409; p value<0.0001) and BMI(-0.363; p value<0.0001) (fig. 1C). That means the increase of Factor 3, characterized by the increase in the levels of HDLc and decrease in LDLc levels, is associated to reduced values of weight, height and BMI.

The analysis of the individuals concerning the sedentary lifestyle showed and average value for Factor 1, which was significantly increased in sedentary individuals (0.27±1.78) compared to the non-sedentary ones (-0.21±1.34; p value=0.03) (fig. 2A). It shows that sedentary individuals had, preferably, high levels of TC, LDLc, VLDLc and TG. Average values for Factor 2 were significantly reduced in individuals that confirmed ingestion of alcoholic beverages at least twice a week (-0.90±0.88), in relation to those who did not consumed alcoholic beverages or only consumed them sporadically (0.07±1.20; p value=0.013) (fig. 2B). In this case, individuals who ingested alcoholic beverages preferably showed increased values of TC, LDLc and HDLc and reduced values of TG and VLDLc. Still, Factor 2 showed a significantly increased average value in individuals without familial history of CVA (0.13±1.18) (fig. 3A) and without dyslipidemia (0.15±1.13) (fig. 3B), compared to those with familial history (-0.36±1.21; p value=0.012; -0.33±1.31; p value=0.010, respectively).

The analysis of the main components represented by Factor 3, regarding sex, showed a significantly increased average value for women (0.50±1.10) compared to men's (-0.55±0.70; p value<0.0001). It means that women preferably show increased levels of HDLc and decreased levels of LDLc, which contrasts with the values obtained for men.

The analysis of the use of contraceptive methods in relation to the factors showed a significant increase in the average value of Factor 1 among contraceptive users (0.53±1.20) and reduced values among the non-users (-0.46±1.86; p value=0.003). It means that women who took contraceptives had higher levels of TC, LDLc, VLDLc and TG. Still, the users of contraceptives also showed a significant increase in the average value of Factor 3 (0.88±1.17) compared to non-users (0.12±0.86; p value=0.001).

Discussion

In this study, sedentary lifestyle and familial history, preferably of SH, DM and CAD distinguish among the risk factor for cardiovascular diseases. Lipid profile, although desirable, shows increased values of LDLc and reduced values of HDLc for men, compared to women. The multivariate analysis for the main components identifies an association among the variations in lipid profile and, par-

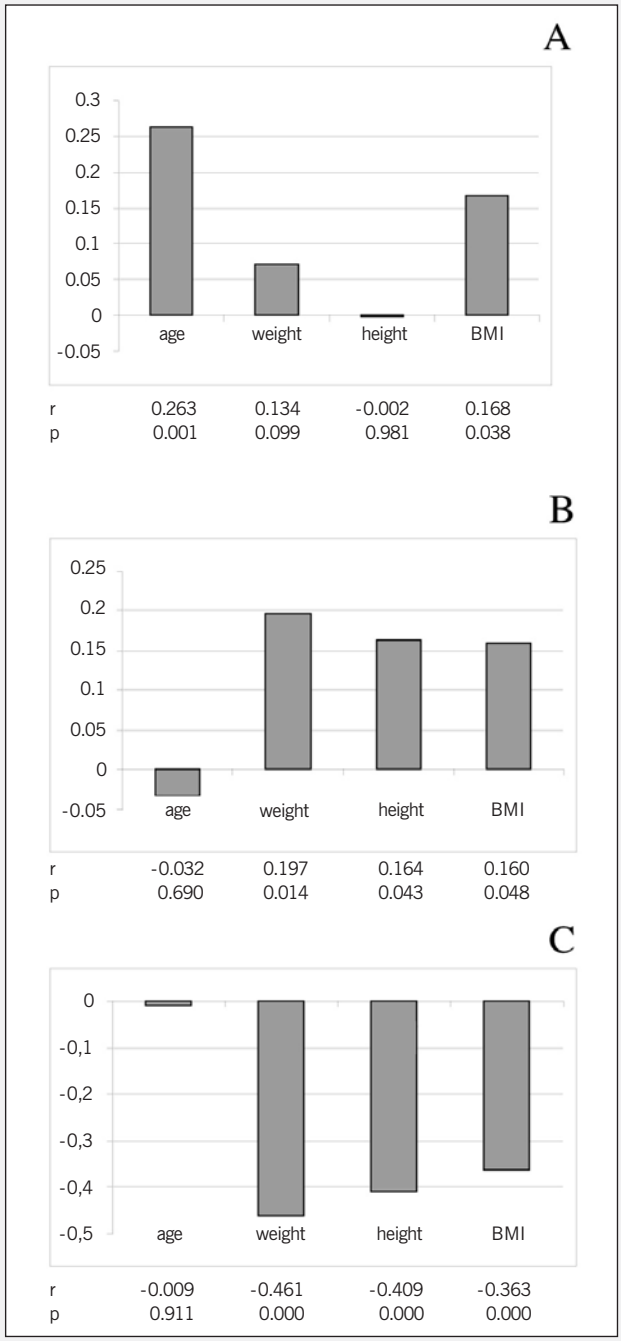
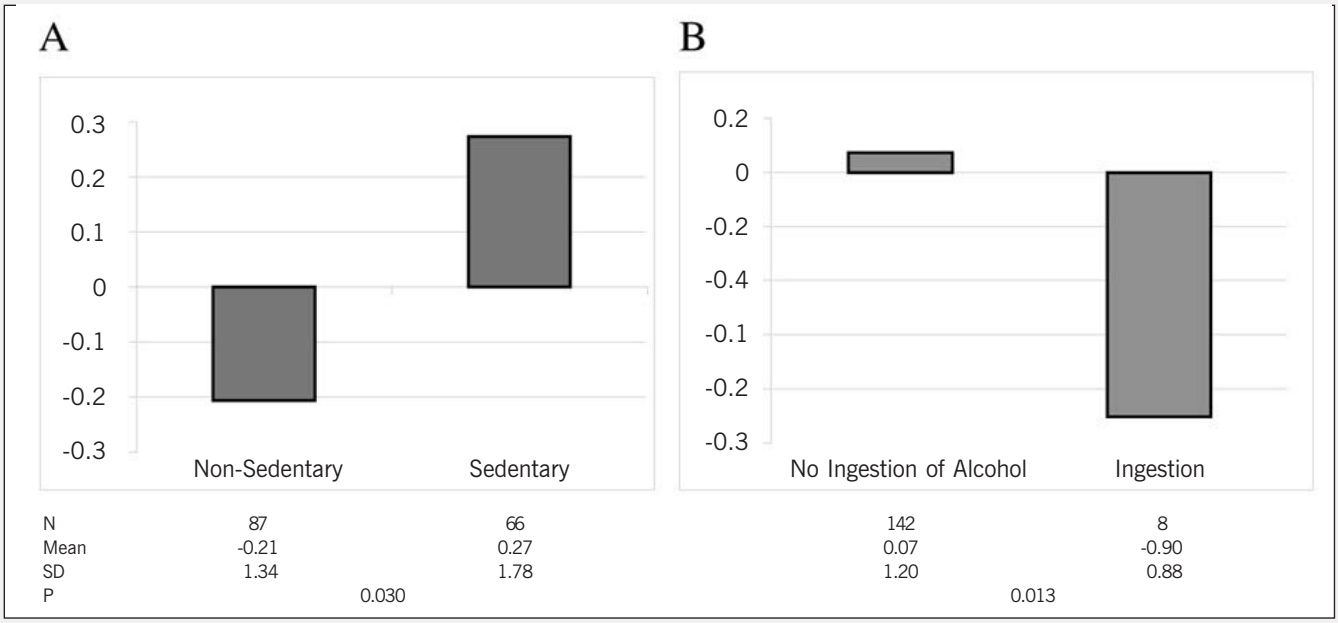
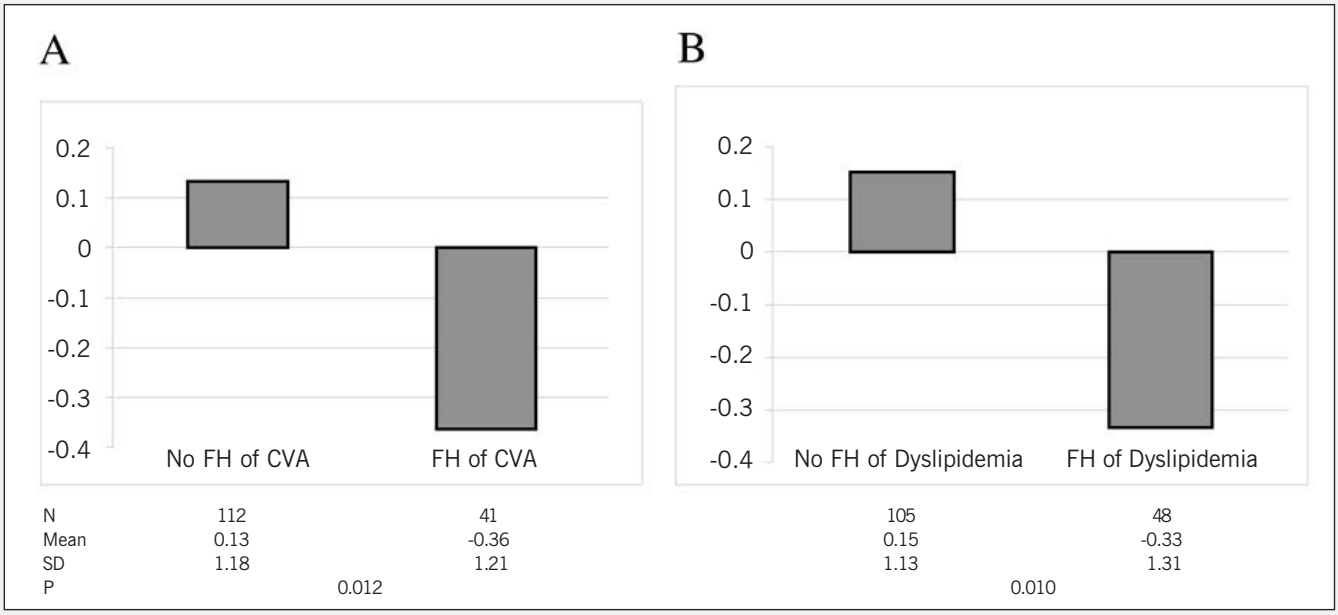


Fig. 1 - Values for Pearson's correlation (r) considering age, weight, height and BMI in relation to: (A) Factor 1 (high or low levels of TC, LDLc, VLDLc and TG altogether); (B) Factor 2 (high levels of TC, HDLc and LDLc and reduced levels of VLDLc and TG or vice-versa); (C) Factor 3 (increased levels of LDLc and reduced levels of HDLc or vice-versa).



N	87	66	142	8
Mean	-0.21	0.27	0.07	-0.90
SD	1.34	1.78	1.20	0.88
P	0.030		0.013	

Fig. 2 - Average values of Factor 1 (high or low levels of TC, LDLc, VLDLc and TG altogether) in relation to sedentary lifestyle (A) and Factor 2 (high levels of TC, HDLc and LDLc and low levels of VLDLc and TG or vice-versa) in relation to alcohol consumption (B).



N	112	41	105	48
Mean	0.13	-0.36	0.15	-0.33
SD	1.18	1.21	1.13	1.31
P	0.012		0.010	

Fig. 3 - Average values of Factor 2 (high levels of TC, HDLc and LDLc and low levels of VLDLc and TG or vice-versa) in relation to familial history (FH) of CVA (A) and dyslipidemias (B).

ticularly, BMI, sedentary lifestyle, consumption of alcohol, familial history of CVA and dyslipidemia and use of contraceptives.

Sedentary lifestyle (43.1%), is presented as the most prevalent risk factor among the students comparable to the study of Fisberg et al.[20] with a frequency of 35.6%, whereas a prevalence of 78.9% was reported by Rabelo et al.[21], also in a Brazilian casuistry, in a similar age range as the one shown. It is probable that the full-time nature of the medicine course, which makes difficult extracurricular activities, prevents from practice of routine physical activity, determining a sedentary lifestyle, in front of computers and television sets, which also take a great part of leisure time from students.

Obesity (BMI=30 kg/m^2) was detected in 2.6% of the students, different from other studies made in individuals in similar age range, which showed a greater prevalence of obese (7.2; 15.8%)[21,22], as well as those showed by the Ministry of Health, characterizing 8% of Brazilian population as obese[15]. However, despite the low prevalence of obese subjects among the students, overweight (BMI=25 and <30 kg/m^2) was detected in 15% of them.

Concerning smoking, in this study 5.9% of students identified themselves as smokers, a lower frequency than the one mentioned by other authors, with a variation from 6.7% to 15.8%, in a young people population[20-22]. In 1999, a cross-section study, which was carried out by Sociedade Brasileira de Cardiologia do Estado de São Paulo – Brazilian Cardiology Association of the State of São Paulo, showed a smoking prevalence of 17% among individuals with age range of 46±16 years old[15]. It is possible that the greater knowledge on smoking damages have influenced in that practice, contributing for the reduced number of smokers among medicine

students. In Framinghan study[23], a directly proportional relationship between the number of cigarettes smoked and the change in the levels of lipoproteins was also verified. The effect of smoking on lipid profile and its association with the enlargement of atheromatous plaque in carotids, related to the number of cigarettes smoked a day [23,24], are recognized. However, in the present study there was no significant correlation between consumption of cigarettes and changes in lipid profile, probably due to the low number of smokers.

Literature documents that the moderate consumption of alcohol has a benefic effect on the mortality due to coronary diseases[25-27]. Such effect is partly due to the capacity of increase of HDLc concentration. However, among disposed individuals, the consumption of alcohol may increase the levels of TG[15]. In this study, 5.2% of the students reported ingestion of alcoholic beverages more than two times a week, showing, in average, an increase in serum levels of TC, LDLc and HDLc altogether, and a decrease in the levels of TG and VLDLc. However, the participants were not asked on the daily amount and the quality of the beverage ingested. There is a reference that, among young men, the moderate consumption of alcohol is associated to a thinner thickness of intimal and middle coats of the vessels, compared to those who do not drink[28]. Therefore, that characterizes a subgroup of individuals identified as majority (94.8%) in the present study, if the students who did not consume alcohol or used it sporadically were considered.

Frequencies of 36.6% for familial history of CAD, 31.4% for dyslipidemia and 26.8% of CVA were recorded in the present study. Moreover, the age at which the event occurred was not considered, which may explain the high prevalence found. There was a significant relationship between familial history, both of CVA and of dyslipidemia, with the increase in the levels of TC, LDLc, HDLc altogether and a decrease in the levels of TG and VLDLc. On the other hand, positive familial history for Cad was detected by Rabelo et al.[21] in 19.6% of youngsters studied and it was not associated with changes of lipid profile.

High frequency of individuals with inappropriate alimentary habits, as high ingestion of red meat (61.4%) and fried food (55.6%) was also detected in this study. However, it was not related to lipid profile, according to the literaure[20,21]. The analysis of the content of the diet and quantification of saturated and unsaturated fatty acids could identify subgroups and, possibly, that association.

Among women, 50.6% were users of contraceptives. That kind of medication can also change the lipid profile, by especially increasing the levels of TC and TG[15]. In this study, the contraceptive users preferably showed increased levels of TC, LDLc, VLDLc and TG, compared to the non-users. However, there was a significant reduction in LDLc levels among those users with increased levels of HDLc, in relation to the non-users. In this case, the type of contraceptive may interfere in the lipid profile due to its influence on the levels of different hormones, such as estrogen and progesterone[20], as well as its length of use. Besides, it is possible that it characterizes a subgroup of individuals with their own lifestyle, whose aspects must be analyzed in future studies.

High level of serum cholesterol is one of the main modifiable risk factors for CAD[11]. In this study, the lipid profile represented by median values is within the reference values[15], without statistic difference between sexes. However, 11.8% of the students showed high levels of TC, 9.8% of LDLc and 8.5% of TG, and 12.4% of reduced levels of HDLc. Moreover, Rabelo et al.[21], in a study on individuals with ages ranging from 17 to 25 years old, detected 36.8% from the casuistry with increased levels of TC. A study carried out in nine Brazilian capitals, with individuals with average age of 34.7±9.6 years old, showed average values for TC of 183±39.8 mg/dl, being significantly higher among women[15].

LDLc is regarded as a causal and independent factor of atherosclerosis, whose reduction diminishes the morbimortality[23,29-33]. In the present study, 9.8% from the students showed increased levels of LDLc, although the median value for the casuistry was lower than 100 mg/dl for both sexes, but significantly higher among men. Those results are accordant with another study, also with students, with increased level of LDLc in 11.1% of them, whose average age was 20.1±2.7 years old, observing a significantly higher average level of LDLc in men than in women[11]. On the other hand, there are references of higher frequency of individuals with altered levels of LDLc in casuistries in the same age range, varying from 7.6% to 44.1%[20-22].

Low levels of HDLc, correlated with the increase of intimal coat of arteries in young individuals[24,28,34], were detected in this study in 12.4% of the students. In this case, men showed lower levels compared to women's, which was the same as demonstrated by other authors[11,21,35]. However, the median values for levels of HDLc were shown higher than 45 mg/dl for both sexes, which is a value considered as desirable for prevention of CAD.

Concerning TG, 8.5% of the students showed altered levels, whereas the median value for the casuistry was 82 mg/dl, without statistically significant difference between sexes. TG level seems to be associated to obesity was shown by Valverde et al.[36], in a study with obese infants, with a prevalence of 35% for high concentration of TG. In the present study, BMI>30 kg/m^2 was detected in only 2.6% of the individuals, probably related the low frequency of high levels of TG. Besides, there is a reference of association between high values of TG and high percentages of lean mass[20]. In this study the percentage of lean mass and fat in the individuals was not analyzed, which made the analysis limited.

In conclusion, the medicine students, although with desired levels for lipid profile, showed risk factors, including familial history for CVD, sedentary lifestyle, use of contraceptives, ingestion of alcohol and high BMI, associated to an altered lipid profile. Higher levels of LDLc and low levels of HDLc among men, point out to a disadvantage of men in relation to women.

Acknowledgements

To Tajara Laboratory, for the performance of biochemical analyses, and to CNPq (PIBIC) for the financial support.

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