Original Article

Lipidic Profile of Individuals without Cardiopathy with Overweight and Obesity

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Objective
To assess the lipidic profile of overweight and obese individuals submitted to cardiologic assessment and who did not show evidences of cardiopathy.

Methods
Sample with 684 individuals, 389 (56.9%) women and 295 (43.1%) men, with age ranging from 14 to 74 (average of 40.6) years old, without evidences of cardiopathy after clinical assessment and analysis of electrocardiogram, thorax radiography, ergometric test on treadmill and two-dimensional Doppler echocardiogram.
The serum profile of lipids and glucose regarding sex and ranges of body mass index (BMI) - eutrophic up to 24.9 Kg/m², overweight 25-29.9 Kg/m² and obese > 30 Kg/m², was studied.

Results
The following means showed a significant statistic difference between the sexes: glucose (mg/dL) in women 90.21±23.13 and men 95.28±28.64 (p<0.001); triglycerides (mg/dL) in women 97.27±55.24 and men 141.47±57.06 (p<0.001) and HDL-C (mg/dL) in women 52.63±13.92 and men 43±10.88 (p<0.001). The average BMI in women was 26.15 and in men 26.33 (p=ns).
In the analysis through BMI ranges there was a significant difference between the sexes (p=0.037). In the categories of overweight and obesity, only the means of triglycerides in women showed a significant statistic difference: overweight women with 102.25±60.68 mg/dL and obese 121.64±63.57 mg/dL (p=0.034).

Conclusion
Women without cardiopathy showed serum levels of glucose, triglycerides and HDL-cholesterol lower than men’s. In both sexes, the means are lower in the comparison with eutrophic and overweight, and only the triglycerides average of women with overweight and obesity showed significant statistic difference.

Key words
lipids, obesity, overweight, epidemiology, body mass index
Asymptomatic individuals eligible for the protocol, in accordance to the criteria of inclusion and exclusion described below, were invited to participate in the protocol, and those who agreed, signed a free and clarified consent term.

The inclusion criteria were as follows: a) individuals from both sexes, of any race and with age ≥ 14 years old, asymptomatic and without previous cardiopathy; b) regular general and special physical examinations performed by a physician; c) regular electrocardiogram; d) thorax radiography with normal cardiac area and pulmonary fields. The exclusion criteria were: a) previous or current history of cardiovascular disease or cardiologic symptoms; b) antecedents of: systemic hypertension, diabetes mellitus, Chagas’ disease, hyperthyroidism, hypothyroidism, chronic obstructive pulmonary disease, asthma, renal insufficiency, chronic inflammatory diseases, anemia, neoplasias and osteo-articular diseases, as these affections can unleash cardiopathies or make impossible the correct cardiologic assessment; c) laboratory exams compatible with diabetes mellitus, liver pathies, anemia, Chagas’ disease and renal insufficiency; d) ergometric test compatible with myocardial ischemia or hypertensive behavior of blood pressure; e) two-dimensional Doppler echocardiogram with dilatation of cardiac chambers, systolic or diastolic dysfunctions and valvopathies.

Six hundred and eighty-four individuals were studied, 389 (56.9%) women and 295 (43.1%) men, with ages varying from 14 to 74 (average of 40.6) years old. The average age of women was 40.85±11.61 years old and men’s was 40.29±11.37 years old. The ethnic distribution was: 516 (75%) whites, 117 (17.1%) mulattos, 32 (4.7%) far eastern individuals and 22 (3.2%) blacks.

The correlations of serum levels of glucose, triglycerides, total cholesterol, LDL-cholesterol, VLDL-cholesterol, total cholesterol/HDL-cholesterol relation and LDL-cholesterol/HDL-cholesterol relation with the body mass index of women and men were studied, and categorized as follows: ≤24.9 Kg/m² eutrophic individual, 25 to 29.9 Kg/m² overweight individual and > 30 Kg/m² obese individual.

The descriptive analysis was carried out through percentages, means, standard deviations and minimum and maximum values. The normality of distributions was assessed through the test of Kolmogorov-Smirnov. The comparison of the means of body mass indexes, of smokers and non-smokers, according to the sex, was done by the test of Mann-Whitney. The comparison of the means of laboratory variables (glucose and lipids) regarding sex and the body mass index were done through the test of Tukey Honest Significant Differences (Tukey-HSD). Significant values of p < 5% were considered. The distribution of other sex-related variables are on table II.

The average of body mass index of women (average of 26.15±4.72) Kg/m² and men’s (average of 26.33±4.04) Kg/m² did not show statistically significant difference. For the following out of the analysis 9 women with body mass index lower than 18.5 kg/m², and who did not show evidences of clinical abnormality, were gathered with eutrophic individuals (BMI up to 24.9 Kg/m²). The distribution of participants of the casuistry regarding sex and the categories of body mass index showed a difference (p=0.037) (tab. III).

We analyzed the glycemia and serum lipids rate regarding the categories of body mass index (eutrophy, overweight, obesity) and concerning sex (women on table IV and men on table V).

The means of glucose showed statistically significant differences among eutrophic women and those with overweight and obesity; there was no significant statistic difference among men. Lipidic values showed statistically significant difference both in eutrophic women and men, comparing with the overweight and obese. In the comparative analysis between the group with overweight and obesity only among women, the means of triglycerides showed significant statistic difference.

### Table I - Comparison of means of the body mass index (BMI) per sex and smoking

<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>n (%)</th>
<th>p (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>389 (56.9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>295 (43.1)</td>
<td></td>
</tr>
<tr>
<td>Non-Smokers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(mean of BMI±sd)</td>
<td></td>
<td>mean (±sd)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>220 (75%)</td>
<td>26.15±4.13</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male</td>
<td>220 (75%)</td>
<td>25.74±3.81</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Smokers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(mean of BMI±sd)</td>
<td></td>
<td>mean (±sd)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>85 (25%)</td>
<td>25.55±3.81</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male</td>
<td>85 (25%)</td>
<td>25.74±3.74</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

(1) - Test of Mann-Whitney; sd = standard deviation.

### Table II - Descriptive statistics of laboratory variables according to sex

<table>
<thead>
<tr>
<th>Laboratory variables</th>
<th>389 women</th>
<th>295 men</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycemia (mg/dL)</td>
<td>90.21 (±23.13)</td>
<td>95.28 (±28.64)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>97.27 (±55.24)</td>
<td>141.47 (±57.06)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Cholesterol (mg/dL)</td>
<td>195.69 (±38.05)</td>
<td>199.39 (±40.87)</td>
<td>0.175</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dL)</td>
<td>52.63 (±13.92)</td>
<td>43.00 (±10.88)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LDL-cholesterol (mg/dL)</td>
<td>123.76 (±33.89)</td>
<td>128.51 (±34.79)</td>
<td>0.056</td>
</tr>
<tr>
<td>VLDL-cholesterol (mg/dL)</td>
<td>19.69 (±11.22)</td>
<td>26.64 (±15.12)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Cholesterol/HDL-cholesterol</td>
<td>3.94 (±1.22)</td>
<td>4.91 (±1.56)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LDL-cholesterol/HDL-cholesterol</td>
<td>2.52 (±0.99)</td>
<td>3.16 (±1.15)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

sd = standard deviation.

### Table III - Grouping of body mass index and sex

<table>
<thead>
<tr>
<th>Body mass index</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 24.9 Kg/m²</td>
<td>183 (47.0)</td>
<td>117 (39.8)</td>
</tr>
<tr>
<td>25 - 29.9 Kg/m²</td>
<td>130 (33.6)</td>
<td>128 (43.2)</td>
</tr>
<tr>
<td>Higher or equal to 30 Kg/m²</td>
<td>76 (19.4)</td>
<td>50 (17.0)</td>
</tr>
<tr>
<td>Total</td>
<td>389 (56.8)</td>
<td>295 (43.2)</td>
</tr>
</tbody>
</table>

p=0.037 (test of association through chi-square).
Discussion

The sample consisted of 56.1% of individuals with excess of weight (BMI ≥ 25Kg/m²), from which 60.2% were men and 43% were women. In a study of prevalence of individuals with overweight and obesity in the northeast and southeast regions in Brazil\textsuperscript{15}, with average age of 29 years and 5 months old, the overweight prevalence was 30% for men and 26.6% for women, and the obesity prevalence was 6.7% for men and 12.7% for women. Our study showed a greater prevalence of obesity and overweight, probably due to a higher average age of individuals involved in the study (40.6 years old). For 2005, the forecast is 57.5% of men and 44.9% of women with some level of overweight or obesity\textsuperscript{16}. Our results already suggest that growing increase of individual with excess of weight.

In the analysis of obesity (BMI ≥ 30Kg/m²), we verified a greater percentage of women (17% of men and 19.4% of women). In the study by Gigante et al.\textsuperscript{17}, the obesity prevalence was 21%.

### Table IV - Comparison of means of glucose and lipids with body mass index (BMI in Kg/m²) of female sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>BMI categories</th>
<th>BMI mean (±sd)</th>
<th>p\textsuperscript{(1)}</th>
<th>p</th>
<th>p</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>normal and overweight</td>
<td>normal and obese</td>
<td>overweight and obese</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>Normal</td>
<td>85.73 (±8.47)</td>
<td>0.040</td>
<td>&lt;0.001</td>
<td>0.182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>92.07 (±17.38)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>97.88 (±44.50)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Triglycerides</td>
<td>Normal</td>
<td>84.11 (±42.49)</td>
<td>0.009</td>
<td>&lt;0.001</td>
<td>0.034</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>102.25 (±50.68)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>121.64 (±63.57)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>Normal</td>
<td>189.68 (±36.60)</td>
<td>0.006</td>
<td>0.217</td>
<td>0.677</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>202.91 (±39.84)</td>
<td></td>
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<tr>
<td></td>
<td>Obese</td>
<td>198.31 (±36.33)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>HDL-Cholesterol</td>
<td>Normal</td>
<td>55.79 (±14.05)</td>
<td>0.014</td>
<td>&lt;0.001</td>
<td>0.069</td>
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<tr>
<td></td>
<td>Overweight</td>
<td>51.43 (±13.11)</td>
<td></td>
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<tr>
<td></td>
<td>Obese</td>
<td>47.05 (±13.15)</td>
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<tr>
<td>LDL-Cholesterol</td>
<td>Normal</td>
<td>116.63 (±32.23)</td>
<td>&lt;0.001</td>
<td>0.031</td>
<td>0.769</td>
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<tr>
<td></td>
<td>Overweight</td>
<td>131.50 (±35.46)</td>
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<tr>
<td></td>
<td>Obese</td>
<td>128.16 (±31.84)</td>
<td></td>
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</tr>
<tr>
<td>VLDL-Cholesterol</td>
<td>Normal</td>
<td>17.71 (±10.57)</td>
<td>0.179</td>
<td>&lt;0.001</td>
<td>0.022</td>
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<tr>
<td></td>
<td>Overweight</td>
<td>19.96 (±10.66)</td>
<td></td>
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<tr>
<td></td>
<td>Obese</td>
<td>24.20 (±12.48)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total Cholesterol /HDL-C</td>
<td>Normal</td>
<td>3.57 (±1.02)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.171</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>4.17 (±1.29)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Obese</td>
<td>4.47 (±1.29)</td>
<td></td>
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</tr>
<tr>
<td>LDL-C/HDL-C</td>
<td>Normal</td>
<td>2.23 (±0.89)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.316</td>
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<tr>
<td></td>
<td>Overweight</td>
<td>2.71 (±0.99)</td>
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<tr>
<td></td>
<td>Obese</td>
<td>2.91 (±1.03)</td>
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</tbody>
</table>

sd = standard deviation; (1) Tukey-HSD test.

### Table V - Comparison of means of glucose and lipids with body mass index (BMI in Kg/m²) of male sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>BMI categories</th>
<th>BMI mean (±sd)</th>
<th>p\textsuperscript{(1)}</th>
<th>p</th>
<th>p</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>normal and overweight</td>
<td>normal and obese</td>
<td>overweight and obese</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>Normal</td>
<td>92.66 (±24.66)</td>
<td>0.610</td>
<td>0.384</td>
<td>0.816</td>
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<tr>
<td></td>
<td>Overweight</td>
<td>96.15 (±29.80)</td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>99.06 (±34.09)</td>
<td></td>
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</tr>
<tr>
<td>Triglycerides</td>
<td>Normal</td>
<td>104.01 (±54.63)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.820</td>
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</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>163.63 (±128.63)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>173.94 (±116.49)</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Total Cholesterol</td>
<td>Normal</td>
<td>187.65 (±40.84)</td>
<td>&lt;0.001</td>
<td>0.027</td>
<td>0.838</td>
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</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>208.66 (±38.42)</td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>204.92 (±39.58)</td>
<td></td>
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</tr>
<tr>
<td>HDL-Cholesterol</td>
<td>Normal</td>
<td>45.64 (±11.01)</td>
<td>0.029</td>
<td>0.001</td>
<td>0.246</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>42.17 (±10.98)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>39.34 (±8.50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL-Cholesterol</td>
<td>Normal</td>
<td>121.36 (±34.75)</td>
<td>0.007</td>
<td>0.213</td>
<td>0.825</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>134.67 (±34.77)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>131.23 (±31.65)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VLDL-Cholesterol</td>
<td>Normal</td>
<td>20.82 (±10.98)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.798</td>
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</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>30.22 (±15.73)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>31.83 (±17.76)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cholesterol /HDL-C</td>
<td>Normal</td>
<td>4.32 (±1.33)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.539</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>5.22 (±1.50)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Obese</td>
<td>5.48 (±1.78)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL-C/HDL-C</td>
<td>Normal</td>
<td>2.82 (±1.11)</td>
<td>0.001</td>
<td>0.003</td>
<td>0.842</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>3.35 (±1.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>3.46 (±1.16)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

sd = standard deviation; (1) Tukey-HSD test.
25% among women and 15% among men. In the study by Schieri et al., obesity was also more prevalent in women than in men. Those findings did not differ when the population from the northeast of Brazil was analyzed. The results from our study reproduce the tendency of difference regarding the excess of weight between the sexes (p=0.037), with prevalence of women in obesity category and men in overweight category.

When we only analyzed hypercholesterolemia (cholesterolemia ≥ 200 mg/dL) we observed a frequency of 46% from the population in our study, and we did not see significant difference between the sexes. Other studies, with identical value of reference, showed prevalence of hypercholesterolemia of 37%, in employees from a metallurgical industry in São Bernardo do Campo, (SP)20 and 35% in a study with adults in the city of Cotia21. A study for determining cholesterol involving 81,262 individuals from other Brazilian cities, besides São Paulo27, showed that 40% of them showed cholesterol rate over 200 mg/dL, and as in the finding in our study, there was not statistically significant difference between the sexes either.

The values of cholesterolemia presented a significant statistic difference among eutrophic and overweight individuals. Curiously that finding did not occur in the comparison between eutrophic and obese individuals. The study by Souza et al., which assessed the prevalence of dyslipidemia in other region of Brazil, showed a significant statistic difference in the prevalence among individuals with and without overweight. However, the same was not seen in relation to obesity.

Regarding the means of LDL-cholesterol, men and women did not show statistically significant difference (128 and 123 mg/dL respectively). Curiously, eutrophic men did not show means of LDL-cholesterol with significant statistic difference in relation to the obese ones, but there was difference in the relation of eutrophic with overweight. Obese and overweight individuals did not show statistically different means. The means of LDL-cholesterol among eutrophic and overweight women were different, as well as between eutrophic and obese. We noted that 44% from the population in the present study showed serum levels of such lipoprotein ≥ 130mg/dL, above those recommended by the 3rd Brazilian Guidelines on Dyslipidemia1. Studies that used the reference point ≥ 130mg/dL observed lower prevalences than that found in our study, as the one carried out by Bertolami et al.23 with metal sheet employees from São Bernardo do Campo (SP), that found 37% of individuals with high levels of LDL-cholesterol, and the study by Cardoso et al.24, in Cotia, observed a prevalence of 34% of that dyslipidemia. The study by Cercato et al.25 did not show any association among the increase in levels of total cholesterol and LDL-cholesterol and obesity.

We observed in the present casuistry that 14% of women and 19% of men showed levels of HDL-cholesterol ≤40 mg/dL. The average values of HDL-cholesterol were higher to women, which was also noted in other Brazilian studies21,26. The statistically significant difference between the means of HDL-cholesterol in women and men probably explains the finding of different rates of total cholesterol/HDL-cholesterol and LDL-cholesterol/HDL-cholesterol, as the total cholesterol and LDL-cholesterol did not show significant different between the sexes.

The values of triglycerides differed concerning sex (p<0.001), the levels of triglycerides were higher in men. In women, the means of triglycerides differed between eutrophic with overweight and obese. In overweight and obese men a significant difference of the means of serum lipids rates was not seen. Other Brazilian studies also found higher prevalences in the levels of serum triglycerides in male individuals27,28. In that casuistry, we observed 6% of women and 22% of men with levels of triglycerides higher than 150mg/dL, a reference point from which preventive measures must be instituted.

Our results concerning HDL-cholesterol and triglycerides are in accordance to the findings in other studies, which means that with the increment of body mass index there is a discreet to moderate increase of triglycerides and reduction of HDL-cholesterol29-31. However, by comparing individuals with overweight and obesity, the significant statistic differences only occurred in the serum means of triglycerides in women.

The glucose means differed between the sexes and were higher in men. The prevalence of hyperglycemia in our population was much lower than those reported by Gus et al.32. The fact that individuals with diagnosis of diabetes mellitus were excluded from the present study would be contributing for the reduction of the prevalence of hyperglycemia in our population in the study.

The casuistry consisted of 684 adult individuals, selected from the clients that the Clinical Unit of General Ambulatory of Instituto do Coração demanded for cardiology assessment, limiting the study. A random and thoughtful population sample in the city of São Paulo would need the inclusion of individuals from many regions in the city and in accordance to the representativeness of the population in that region. However, that information was not possible, which made this type of analysis impossible. Besides, other risk factors, such as familial history of cardiopathy, were not quantified.

The body mass index has the limitation of being little descriptive concerning the distribution of muscular adipose tissue of a single patient. The assessment methods of body fat distribution, although efficient, were not sufficiently assessed as indicators of cardiovascular risk, and they are not being used in clinical practice7.

Concluding, the casuistic population sample under study, without cardiopathy evidences, women showed lower means of serum levels of glucose, HDL-cholesterol and triglycerides than men. In both sexes, those means are lower in comparison between eutrophic and with excess of weight, and only the triglycerides means in women with overweight and obesity showed significant statistic difference.
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