1 Introduction
Along the last three decades, chronic non transmissible diseases (CNTD), including cancer and cardiovascular diseases (CVD), exceeded infectious diseases in incidence and mortality, through a phenomenon called epidemiological inversion (Viniinski, 2003). Globally, CVD related deaths are higher than those of all cancer together (Stocker e Keaney, 2004).

There are several risk factors for CVD: a) familial history (one of the relatives diagnosed with CVD before 55 years old or with cholesterol level higher than 240 mg/dl); b) hypertension (e.g. high intake of sodium); c) smoking; d) diabetes; e) physical inactivity; f) obesity; g) ethnic. Among these factors, dyslipidemias (especially hypercholesterolemia) are key aspects for compromising the endothelial function (Napoli, Williams-Ignarro et al., 2004; Wilmisen, Spada et al., 2005).

CNTD have early origin and a lag between their origin and their clinical manifestation. This lag is associated to several co-morbidities, with significant effects over the well being and the life time of individuals. Children and adolescents of the current generation possibly have a higher level of exposure to risk factors to CNTD than the previous generations, mainly due to their lifestyle with low physical activity and unbalanced diet (rich in fats and carbohydrates and poor in micronutrients as vitamins and minerals).

The early identification of individuals with an increased risk is the basis for the adoption of measures aiming prevention or a closer clinical follow-up (Watters e Mcleod, 2003; Nebert e Vesell, 2004; Nakajima e Yokoi, 2005). Therefore, ensuring that children grow up in safe and healthy environments is a worthy goal. Building on evaluations of child nutritional status in developing periodic national nutritional surveillance programmes will contribute substantially to the planning and evaluation processes required by such endeavours (Arizaa e Binnsa, 2004).

The study population was composed by the school-aged individuals (8-18 years old) of Santa Cruz do Sul, RS, Brazil. A random sample based in the prevalence of obesity of 20% as detected by the study of Gigante et al. (1997), error of 3% and confidence of 95% was selected from this population. A total of 578 individuals randomly selected within 16 schools already sampled in previous researches (data not showed) were used in the study. The studied variables were: gender, age (as interval), nutritional state, AP, Tg and TC.

2 Material and Methods
2.1 Population and sample
The study population was composed by the school-aged individuals (8-18 years old) of Santa Cruz do Sul, RS, Brazil. A random sample based in the prevalence of obesity of 20% as detected by the study of Gigante et al. (1997), error of 3% and confidence of 95% was selected from this population. A total of 578 individuals randomly selected within 16 schools already sampled in previous researches (data not showed) were used in the study. The studied variables were: gender, age (as interval), nutritional state, AP, Tg and TC.

2.2 Anthropometric evaluation and measurement of arterial pressure
The weight and the height of individuals were obtained by standard methods and the BMI was calculated by dividing the weight in Kg by the square of the height in meters. Overweight and obesity were classified according to the percentile distribution to gender and age standardized by Must, Dallas e Ditz (Vitolo, 2003), through the percentile 85 for overweight and obesity. Triceptal and subscapular skin-fold thickness were measured using skin-fold calipers and used to calculate the BFP, which was classified according to the table of fat percent for children of Lohman (Heyward e Stolarczyk, 2000).

The AP was measured by the use of an esfignomanometer in individuals in rest for about 30 minutes previously to the measure. The percentile distribution adapted from The fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents by the IV Diretrizes Brasileiras de Hipertensão (Sociedade Brasileira De Cardiologia, 2004) was used to classify AP; being the values between the percentiles 90 e 95 considered in the limit and the values over the percentile 95 considered as hypertension.

2.3 Evaluation of triglycerides and total cholesterol
Blood samples of the individuals under 12 hour rest and fasten were analyzed for Tg and TC by an Accutrend GTC monitor. The reference values for the ages from 2 to 19 years of the I Diretriz de Prevenção da Aterosclerose na infância e na adolescência were used in order to classify the level of Tg and TC (Sociedade Brasileira De Cardiologia, 2005).

2.4 Statistical analysis
Data were tabulated and analyzed in the Statistical Package for Social Sciences (SPSS) version 10.0. Chi-square test was used to detect differences and associations between variables. The level of significance was of P<0.05.

3 Results and discussion
From the 578 individuals that participated in the study, 42.2% were males and 57.8% were females. Regarding to age, 36.3% had 10-12 years, 32.7% had 13-15 years, and 15.9% had 8-9 years, and 15.1% had 16-18 years.

Table 1 shows the nutritional state in the study population. Males showed BFP than females. The incidence of low weight (7.8%) and overweight or obesity (25.4-27%) was very similar between males and females.
Obesity is a widespread problem worldwide. In US, the percent of children (6 to 11 years of age) and adolescents (12 to 19 years of age) with obesity has increased up three fold between the late 1970s and 2000, harming nowadays about 15% of the overall school-age individual in the country; and even higher values among vulnerable groups. This value would double if one includes individuals defined as at risk for overweight in the statistics (BMI greater than the 85th percentile) (Baker, Barlow et al., 2009). In Brazil between 1974 and 1997, the prevalence overweight (including obesity) increased 3.5 fold. In 1997, the average prevalence of obesity/overweight was of 14% (17% for 6-9 years and 13 % for 10-18 years old) (The International Association for the Study of Obesity, 2004). Albano & Souza (2001) detected very high levels of overweight (19.1%) and obesity (10.5%) in individuals with 11-17 years old in the city of São Paulo, Brazil. In a study in children and adolescent aging 7-17 years in Maceió, Brazil, Silva et al (2005) observed the prevalence of 9.3% of risk of obesity (overweight) and 4.5% of obesity. The level of overweight (including obesity) detected in Santa Cruz do Sul, Brazil was intermediate to the ones found in Maceió and São Paulo, Brazil.

There were more subjects with limit hypertension than hypertensive individuals in either males or females. The level of hypertension was higher among females (Table 2). Table 2. Classification of the level of systolic arterial pressure in school-aged individuals of Santa Cruz do Sul-RS, Brazil.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Males</th>
<th>Females</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>93.0</td>
<td>93.1</td>
<td>93.1</td>
</tr>
<tr>
<td>Limit</td>
<td>4.5</td>
<td>3.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2.5</td>
<td>3.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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</tbody>
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Epidemiological studies about AP in children and adolescents in Brazil showed prevalence ranging from 0.8-8.2%, depending on the method used for measuring the arterial pressure, on the parameter for defining diastolic pressure, in age and in the number of measures (Sociedade Brasileira De Cardiologia, 2005). The prevalence of hypertension in Santa Cruz do Sul, RS was in the bottom of the range observed in Brazil. The prevalence was bellow an study in Bento Gonçalves, RS, Brazil with individuals aging 6-14 years showed systolic hypertension in 5% of the studied population (Gerber & Zielinsky, 1997). Santa Cruz do Sul and Bento Gonçaslves are countryside cities 250 Km away that were established by European immigrants.

Hypertriglyceridaemia was more prevalent among females and present in about 1/3 of the individuals of this gender (Table 3a). The incidence of hypercholesterolemia was similar between males and females (10.7-11.4%), being higher among females. Table 3b. Table 3. Classification of the level of triglycerides and total cholesterol in school-aged individuals of Santa Cruz do Sul-RS, Brazil.

A - Triglycerides

<table>
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<th>Males</th>
<th>Females</th>
<th>Average</th>
</tr>
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<tbody>
<tr>
<td>Normal</td>
<td>58.6</td>
<td>44.0</td>
<td>50.2</td>
</tr>
<tr>
<td>Limitrofe</td>
<td>20.9</td>
<td>22.2</td>
<td>21.6</td>
</tr>
<tr>
<td>Higher</td>
<td>20.5</td>
<td>33.8</td>
<td>28.2</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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</table>

B - Total cholesterol

<table>
<thead>
<tr>
<th>Classification</th>
<th>Males</th>
<th>Females</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>67.6</td>
<td>64.1</td>
<td>65.6</td>
</tr>
<tr>
<td>Limitrofe</td>
<td>21.7</td>
<td>24.6</td>
<td>23.4</td>
</tr>
<tr>
<td>Higher</td>
<td>10.7</td>
<td>11.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Several studies in different Brazilian cities with school-age individuals showed that the prevalence of hypertriglyceridaemia in the country ranges from 4.7% in Itajaí, SC (Grillo, Crispim et al., 2005) to 22.5% in Londrina, PR (Seki, Seki et al., 2001). The prevalence of hypercholesterolemia ranges from 3.1% in Itajaí, SC (Grillo, Crispim et al., 2005) to 35% in Campinas, SP (Moura, De Castro et al., 2000). The average level of hypertriglyceridaemia of the population of Santa Cruz do Sul, RS was higher than the city with the highest prevalence, Londrina, PR and higher level among females must be monitored closely in future. Conversely, the prevalence of hypercholesterolemia is in the middle of the range observed in literature. The values observed agree with those found in Florianópolis, Brazil that showed 22% of hypertriglyceridaemia and 10% of hypercholesterolemia among individuals aging 7-18 years (Giuliano, Coutinho et al., 2005). There was a significant association between HA, Tg and BMI and BFP for both males and females as well as an association between TC and BFP only for males (Table 4). Moreover, there were significant associations between TC and Tg (p<0.001) and PAS and TC (p<0.01) (only for males.

Table 4. Result of the chi-square test comparing arterial pressure, triglycerides and total cholesterol according to body mass index and body fat percentage in the tested population.
Alarge study on American adults showed that obesity is associated with a relative adjusted risk of 3.4 for diabetes mellitus, 3.5 for hypertension, 1.9 for hypercholesterolemia, and 1.8 for poor health. Although the data in childhood are less exhaustive, about 60% of overweight 5- to 10-year-old children are reported to have at least one associated cardiovascular risk factor, and 25% have 2 or more. Diabetes mellitus, hypercholesterolemia, and arterial hypertension have been shown to promote atherosclerosis by their cumulative effects on the vascular endothelium (Gielen e Hambrecht, 2004). This association was also evident in the result of this study.

Like our study, Coronelli & Moura (2003) showed association relating BMI and CT classifications. Increased levels of low density lipoproteins (LDL), decreased levels of high density lipoproteins (HDL) and raised serum Tg levels are highly correlated with increased triceps skin-fold thickness among adolescents as well as with the with centile scores of BMI. According to a prospective studies, Lipoprotein levels in childhood were associated with their levels when they became adults; more strongly for TC (r = 0.6) and LDL (r = 0.4-0.6) than for high-density lipoprotein cholesterol (r = 0.4) and Tg (r = 0.1-0.4), being TC the best predictor for adult dyslipidaemia. Moreover, an effect of weight gain on future lipid and lipoprotein levels was also demonstrated (Lobstein, Baur et al., 2004). In spite of the fact that 20-30% of obese children have hypertension with a 2.4 risk to present it than the eutrophic (Oliveira, Mello et al., 2004), Coronelli & Moura (2003) did not find association between BMI and AP in children aging 7-10 years. There was a significant association between CT and Tg and AP only for males. While some studies found association between AP levels and TC [e.g. (Rona, Qureshi et al., 1996) in British children] others found no association [e.g. (Gerber e Zielinsky, 1997) in Bento Gonçalves, Brazil].

The high incidence of overweight and hypertriglyceridaemia are comparable with the levels of urban areas of Brazil and USA in spite of the fact that Santa Cruz do Sul, RS, Brazil is a countryside city with availability of healthy foods and recreation sites. Indeed, these individuals must be closely monitored in order to reduce the risk of CVD and other CNTD.

4 Acknowledgements
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5 References


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Los factores de riesgo cardiovasculares y el estado nutricional en escolares de Santa Cruz do Sul, RS, Brasil

Resumen: El sedentarismo y la transición nutricional han aumentado la prevalencia de sobrepeso globalmente, aumento de enfermedades crónicas no transmisibles (DCNT), incluyendo cáncer y enfermedades cardiovasculares (ECV). Este estudio transversal objetivo: 1) caracterizar la población escolar de Santa Cruz do Sul, RS, Brasil según el índice de masa corporal (IMC) y el porcentaje de grasa corporal (PGC); 2) evaluar los niveles de PA, Tg y CT en la misma población; y 3) buscar asociación entre las variables evaluadas para relacionar los factores de riesgo cardiovascular con el estado nutricional. La muestra incluye 578 escolares (42,2% masculino y 57,8% femenino) con edades entre 8 y 18 años. Los resultados indican baja incidencia de sobrepeso (incluyendo obesidad) por el PGC (21,3% en el sexo masculino y 24,9% en el sexo femenino); incidencia moderada de hipercolesterolemia (25,4% en el sexo masculino y 33,8% en el sexo femenino); alte incidencia de hipertrigliceridemia (20,5% en el sexo masculino y 33,8% en el sexo femenino); e incidencia moderada de hipertensión (2,5% en el sexo masculino y 3,3% en el sexo femenino); entre PA, Tg e IMC y PGC, tanto para el sexo masculino como para el femenino, así como una asociación entre el CT y PGC sólo para el sujeto masculino. Los datos apuntan una asociación significativa entre PA, Tg e IMC y PGC, tanto para el sexo masculino como para el femenino, así como una asociación entre el CT y PGC sólo para el sujeto masculino.