Original Article

Determinants of Risk of Cardiovascular Diseases in Schoolchildren

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Objective

To investigate the occurrence and association of arterial hypertension with several lifestyle variables.

Methods

Transversal population-based study with a random sample of students (7 to 14 years of age) of public and private schools. Variables investigated were nutritional status, blood pressure, and lifestyle (tobacco use, alcohol intake, physical activity and eating habits).

Results

Out of the 3,169 schoolchildren assessed, 5.0% had arterial hypertension and 6.2% had normal-high blood pressure. Classification by gender shows boys 6.4% and girls 6.0% with normal-high blood pressure, and boys 4.3% and girls 5.7% with arterial hypertension. Body mass index (BMI) measurements identified 16.0% excess weight students, 4.9% of whom were obese. A significant association ($p = 0.01$) between arterial hypertension and excess weight was observed. Among the students participating in the study, 11.6% did not attend physical education classes and 37.8% had sedentary leisure habits. Twenty students (0.6%) were smokers and 32.7% had already experimented with alcohol. None of these variables showed statistical significance as to blood pressure values and nutritional status.

Conclusion

In light of the findings in this study which show schoolchildren with a higher than expected frequency of mean blood pressure and BMI values, associated with a lifestyle that tends to favour the development of cardiovascular diseases, we felt led to propose interventional measures focused on the school as an agent of change and capable of conveying information to family units. This possibility encourages us to propose that schools be partners in promoting health.

Key words

Prevention and control, epidemiology, anthropometry, arterial blood pressure, student health

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Received on 09/27/05 • Accepted on 09/30/05

The past decades have witnessed important changes in living and health conditions of Brazilians. Not only has the population aged, it has also adopted new working and leisure standards, and undergone significant changes as to the quality and quantity of the food consumed[1].

These interrelated changes have produced a shift in health and disease conditions that challenges public health authorities. Concomitant and rapidly- occurring demographic, nutritional, and epidemiological transitions translate into increased rates of non-transmissible diseases and injuries[2].

Explanations for this transition in the population health profile have been sought in studies conducted with adults, but the number of studies focusing on children is much smaller. Considering that biological changes take place more rapidly during childhood and adolescence than in any other period of life, it is easy to suppose that this biological moment represents an important area of investigation for determining additional risks, central to the study of diseases[3].

Arterial hypertension and the so-called environmental factors have been identified as variables associated with this change in epidemiology. Arterial hypertension is a chronic disease, characterized by the persistence of arterial pressure levels above those arbitrarily defined as limits of normalcy [reference values]. It is the most common risk factor for cardiovascular disease, and is considered a severe public health problem for all socioeconomic groups[2,4].

The determination of its onset is based on factors triggered during childhood. A classic study on the detection of cardiovascular risk in children, the *Bogalusa Heart Study*, disclosed that not only does the etiology of most cardiovascular diseases has its roots in the early years of life, and as such can be identified at a very early stage, but environmental factors such as eating habits, tobacco use and physical activity also greatly influence the inception of arterial hypertension and obesity. The study concludes by highlighting the fact that lifestyle and personal habits that influence the onset of cardiovascular diseases are learned and begin at very early stages of life[5-7].

For this reason, interventions during childhood and adolescence, periods that are critical for the development of several risk factors, have been recommended as a measure to prevent unfavorable outcomes in adult life[8].

The only studies on the prevalence of risk factors for non-transmissible diseases conducted in Goiânia were *Carment*[9] and the *Estudo Centro-Oeste*[10]. *Carment* investigated individuals over fifteen years of age and showed a prevalence of 35.4% cases of arterial hypertension; 44.1% of excess weight; 22.9% of tobacco use and 66.2% of sedentarism. On the other hand, the *Estudo Centro-Oeste* showed a prevalence of 36.4% of arterial hypertension, 42% of excess weight, and 65% of sedentarism in individuals over eighteen years of age.

Seeking to increase knowledge about health status and the risks of children and adolescents attending the school network, this study had the objective of investigating the occurrence of arterial hypertension and excess weight, focusing on the association between the two and with several lifestyle variables. The results allowed a proposal of intervention in the events identified, using the school environment as a propagator of health-promoting measures.

Methods

The *Projeto Carminho*, on which our study is based, is part of a research line on arterial pressure and cardiovascular risk factors (CVRFs) in children and young people being conducted in the city of Goiânia since 2001. This project was partially funded by the PanAmerican Health Organization, Ministry of Health, State Department of Health of Goiás and *Fundação de Apoio à Pesquisa da Universidade Federal de Goiás* (Research Sponsorship Foundation of the Federal University of Goiás). It also has the logistic support of the State Department of Education of Goiás and Municipal Departments of Health and Education of Goiânia.

Carminho was a transversal population-based study conducted with a sample consisting of children and adolescents between seven and fourteen years of age, boys and girls, who attended schools in the eastern region of Goiânia, the capital of the State of Goiás, from March 2001 to June 2002. The sample was selected by allotment among the 41 schools in the East Region (17 municipal schools, 21 state schools, and 3 private schools), and included primary and secondary schoolchildren. Seventeen schools took part, proportionally representing the number of public and private schools that are administratively linked to the Regional Central Unit of the Municipal Department of Education and the East Region of the State Department of Education. Based on the total number of students from the selected schools and the number of students by grade, a proportional sample to be collected in each school was calculated. The sample size consisting of 3,388 children and adolescents, between 7 and 15 years of age, was calculated using a 0.3 error and a 2,985 standard deviation, and stratified by gender and age into four age groups, consisting of 847 students each.

The variables analyzed were age, anthropometric measurements, arterial pressure, and lifestyle habits. *Body weight* was mesured by a Kratos portable digital electronic weighing scale, with 150 kilogram capacity and 50 gram accuracy, calibrated by Inmetro. *Height* was measured with a Secca anthropometer attached to the wall, with an accuracy level of 0.1 cm. Values obtained were recorded in kilograms and meters[11,12]. To obtain the height percentile, National Center of Health Statistics height tables by age and gender were used from EpiInfo software[13]. The Body Mass Index [BMI = weight (kg)/height (m)^2] classified and categorized in the 85th

percentile (P85th) those students who were overweight, and in the 95th percentile or above (P95 th) the students who were obese. These values correspond to BMI 25 and 30 kg/m^2, respectively, adjusted for age and gender (NHANES I)[14]. For the discussion of the results, these categories (P85 th + P95 th) were grouped under the term *excess* weight.

Arterial pressure was measured with an aneroid sphygmomanometer, with pre-school, teen, and adult cuff sizes, and an adult stethoscope. Two blood pressure measurements were taken of the right arm in the sitting position - resting for two minutes before the first measurement, and with a two-minute interval before the second measurement; values were estimated based on the first and fifth phases of Korotkoff sounds. The first measurement was ignored and arterial hypertension was identified when the systolic blood pressure (SBP) and/or the diastolic blood pressure (DBP) were in the 95th percentile or above (³ P95). The normal-high blood pressure was identified when the SBP and/or the DBP were in the 90th and 95th percentiles (³ P90 but less than P95), taking into consideration gender, age, and height of the child/adolescent[15,16].

Variables referring to *lifestyle habits* were tobacco use (smoker, never smoked, or ex-smoker), alcoholic beverage intake (experimenting with and local**)**, physical activity at school (number of weekly physical education classes), and use of leisure time (*sedentary*, when most of their free time was spent in poor calorie-burning activities, such as watching TV, playing videogame, using the computer, etc.; *light activities*, when most of the time was spent riding a bicycle, playing ball, running, or any kind of sport; and *moderate-intense activity* when the student spent his/her free time training for competitions. The frequency of meals over the last year (daily, weekly, occasionally, or rarely/never) was also investigated, but will not be covered in this study.

The data collection instrument proposed by the Projeto *Carmen*[17] was modified to be used in our study. The teams received an Interviewer Manual, with standardization of the information to be collected.

Children and adolescents were interviewed and evaluated at their own schools, after a meeting held with the teachers to present the project, allocate the groups, and define the working timeline. On the set date, activities began with an informal conversation in the classroom in order to explain the procedures and guarantee normalcy of the teachers' educational activities. The time set for measuring the children's blood pressure was to be right before the break, and not concomitant with any activity related to physical education.

Data collected were encoded and analyzed taking into consideration the prevalence of the risk factors individually or combined. The association of arterial pressure, BMI, physical activity, tobacco use, and alcoholic beverage intake variables was verified by means of a univariate analysis. Proportions were compared using the chi-square test (c2), and a 5% level of significance, or $p < 0.05$.

Before the investigation began, the proposal was presented during a collective meeting with the State Department of Education of Goiás and the Municipal Department of Health of Goiânia. The deliberations were submitted for appreciation & signature corroborating the acceptance by the principals of the participating schools. Informed Consent forms were distributed to the parents of the children in a meeting held for this purpose. The project for this investigation was approved by the Ethics in Human and Animal Medical Research Committee of the *Hospital das Clínicas* of the Federal University of Goiás.

Results

Out of the 3,169 children and adolescents evaluated (95.3% of the sample), 1,600 (50.5%) were boys between seven and fourteen years of age. Table 1 displays the most important findings and highlights the prevalence of 158 cases (5.0%) of arterial hypertension and 196 cases (6.2%) of normal-high blood pressure. Categorization by gender shows 102 boys (6.4%) and 94 girls (6.0%) with normal-high blood pressure and 69 boys (4.3%) and 89 girls (5.7%) with arterial hypertension.

The grouping of these values (P 90 + P 95) shows that 171 (10.7%) boys and 183 (11.2%) girls had altered blood pressures relative to the reference values, with statistically significant differences ($p < 0.00$) at the ages of 9/10 years and 8/9 years for boys and girls, respectively (Tables 2 and 3).

The results indicate that 198 (6.2%) students had (isolated) elevated SBP, 80 (2.5%) students had (isolated) elevated DBP, and 76 (2.4%) students had both (elevated SBP and DBP). No significant gender-related differences were observed.

BMI measurements showed that 228 (7.2%) students were underweight, 2,435 (76.8%) were eutrophic, 350 (11.0%) were overweight, and 156 (4.9%) were obese. The combination of the last two values indicates that 506 (16%) subjects of the population were overweight (Table 4). BMI distribution decreases in a statistically significant fashion ($p < 0.01$) from the age of twelve years for boys, and in a less accelerated way among girls; nevertheless, there was a tendency towards excess weight (overweight + obesity) for both genders at all ages (data not shown).

Crossing BMI information with blood pressure levels indicates that low body weight is not associated with an elevation of arterial pressure levels, either in boys ($p= 0.11$) or in girls ($p = 0.49$). It also shows that high BMI values (overweight and obesity) are statistically associated with abnormal arterial blood pressure levels ($p = 0.01$), whether the cut-off point is set in the 90th percentile or in the 95th percentile (fig. 1).

Two thousand eight hundred and one (88.4%) students take part in the physical education activities at their schools (of this number, 23.0%, 42.0%, and 23.4%

Table 1 – Characteristics of the sample analyzed

Variable	Total		Boys		Girls	
	F	%	F	%	F	%
Sample size	3169	100.0	1600	50.5	1569	49.5
Average age (years)	10.7		10.72		10.76	
Blood pressure						
Normal (< P 90)	2815	88.83	1429	89.31	1386	88.34
Normal-High (≥ 90 P < 95)	196	6.18	102	6.38	94	5.99
Arterial hypertension (P ≥ 95)	158	4.99	69	4.31	89	5.67
Elevated SBP (≥ 95)	198	6.25	62	3.88	70	4.46
Mean SBP	100.41 mmHg (60-166)		100.48 mmHg		100.33 mmHg	
Elevated DBP (≥ 95)	80	2.52	20	1.25	32	2.04
Mean DBP	59.33 mmHg (30-110)		59.4 mmHg		59.3 mmHg	
Nutritional status						
Underweight	228	7.2	128	8.0	100	6.5
Overweight	350	11.0	172	10.8	178	11.3
Obese	156	4.9	85	5.3	71	4.5
Mean BMI	18.32		17.69		18.96	
Smoking habit:						
Present	20	0.6				
Alcoholic beverage						
Previously experimented	1036	32.7				
Physical activity						
Sedentary (school)	368	11.6	180	11.3	188	12.0
Sedentary (leisure)	1199	37.8	457	28.6	742	47.3

F- frequency; SBP- systolic blood pressure; DBP- diastolic blood pressure; BMI- body mass index.

Table 2 – Distribution of male children and adolescents according to age and blood pressure levels. Goiânia 2001/2002

Age	Normal		Normal-high		High		Total
	F	%	F	%	F	%	
07	148	88.6	09	5.4	10	6.0	167
08	181	85.0	18	8.5	14	6.6	213
09	136	81.0	17	10.1*	15	8.9*	168
10	139	81.2	17	10.1*	13	7.7*	169
11	173	91.1	12	6.3	05	2.6	190
12	219	92.8	10	4.2	07	3.0	236
13	226	94.6	09	3.8	04	1.7	239
14	207	95.0	10	4.6	01	0.5	218
Total	**1,429**	**89.3**	**102**	**6.4**	**69**	**4.3**	**1,600**

F- frequency; (*) p < 0.00.

attend classes once, twice and three times during the week, respectively). With regard to information about the frequency of out-of-school physical activities, 1,199 students (37.8%) are sedentary, 1,786 (54.0%) have light physical activities, and 184 (5.4%) engage in moderate-to-intense physical activities. However, there is no significant association between physical education at school or leisure and changes in blood pressure levels (p = 0.62).

The study investigated the habit of smoking cigarettes. According to pooled data, in some or all cases, 20 (0.6%), students confirmed having smoked cigarettes. One thousand and thirty-six (32.7%) students reported having experimented with alcoholic beverages. It should be highlighted that very often the experimentation took place within family environment, and that 55.0% (571 out of 1,036) of these students were twelve years of age or under.

Discussion

This study focused on the frequency of arterial hypertension in children and adolescents, which is considered a risk factor for cardiovascular diseases (CVD) in adult life. The school environment was chosen as

Table 3 – Distribution of female children and adolescents according to age and blood pressure levels. Goiânia 2001/2002

Age	Normal		Normal-high		High		Total
	F	%	F	%	F	%	
07	140	86.4	08	4.9	14	8.6	162
08	122	77.7	18	11.5*	17	10.8*	157
09	142	77.2	18	9.8*	24	13.0*	184
10	178	87.3	17	8.3	09	4.4	204
11	155	86.1	16	8.9	09	5.0	180
12	223	94.5	10	4.2	03	1.3	236
13	247	95.7	06	2.3	05	1.9	258
14	179	95.2	01	0.5	08	4.3	188
Total	**1,386**	**88.3**	**94**	**6.0**	**89**	**5.7**	**1,569**

F- frequency; (*) p < 0,00.

Table 4 – Distribution of children and adolescents according to gender and body mass index categories (BMI). Goiânia 2001/2002

Gender	Underweight		Eutrophic		Overweight		Obese		Total
	F	%	F	%	F	%	F	%	
Male	128	4.0	1,215	39.5	172	5.4	85	2.7	1,600
Female	100	3.2	1,220	38.5	178	5.6	71	2.2	1,569
Total	**228**	**7.2**	**2,435**	**78.0**	**350**	**11.0**	**156**	**4.9**	**3,169**

F- frequency.

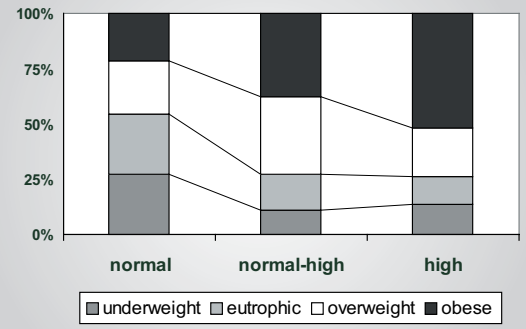

***Fig 1** – Distribution of children and adolescents according to Body Mass Index categories and blood pressure levels. Goiânia, 2001/2002.*

the field for investigation, considering its role in formal education, fundamental for building lifestyle habits. The study also focused on the Body Mass Index as an indicator of the students' lifestyle, as shown by their physical activities and eating habits, and evaluated tobacco use and alcoholic beverage intake as well, since these habits are considered markers of cardiovascular risks.

Among the risk factors for cardiovascular diseases, arterial hypertension and excess weight are the most important ones. The association of both showed statistical significance.

In our sample, 158 students (5.0%), 69 (2.2%) boys and 89 (2.8%) girls, had arterial hypertension. The statistical analysis of arterial pressure values found in the 90th and 95th percentiles did not indicate any statistically significant difference. These findings compare with other studies conducted with children and adolescents in several countries, including Brazil. During the 1990s, these values ranged from 1.2% to 13.0%[18].

Using the 95th percentile as the cut-off point for determining arterial hypertension, the Rio de Janeiro transversal study, with cases similar to those of this study, identified 6.9% and 8.4% of its participants with systolic blood pressure (SBP) and/or diastolic blood pressure (DBP), respectively, above the 95th percentile in two different time points[19]. On the other hand, the Belo Horizonte Study [20] that included children and adolescents from six to eighteen years of age, found a 3.5% occurrence [of hypertension], whereas the Maceió[21] study identified 9.4% in the group with ages seven-to-seventeen.

Sinaiko et al[22], in the Minnesota Study, found 6.4% of arterial hypertension in one single measurement. Simionato et al[23], analyzing schoolchildren from six to eighteen years of age, found 6.9% of SBP and/or DBP, with a percentile equal to or greater than 95.

Other studies indicate that, even when the prevalence of arterial hypertension is not expressive among children, the presence of lifestyle- and hereditary-related risk factors would determine the existence of arterial hypertension in adulthood[24-26].

This evidence seems to relate to *tracking*, a term that identifies the persistence of a certain risk factor until adulthood, such as blood pressure values observed in

childhood and those measured in maturity, indicating that elevated BP levels in children seem to be strong predictors of arterial hypertension in adult life[27].

The blood pressure behavior in adolescent boys and girls identified in this study was also observed by Szklo[28], who reported similar SBP figures for children up to twelve years of age, and higher levels for girls. Richey[29] also identified higher blood pressure levels in girls than in boys at the onset of adolescence, with an inversion of this proportion at the end of this age bracket. The most probably hypothesis would be the role of earlier female puberty[27].

The *Bogaluse Heart Study* shows that arterial pressure measured in the same child may vary (3.4 mmHg in the mean SBP and 6.5 mmHg in the mean DBP) and suggests that measurements be repeated, as a routine, allowing the determination of that child's blood pressure pattern[30]. As it is not always possible to perform this procedure in population studies conducted in schools, it is recommended that any child with arterial pressure _ P95 be referred to a reference center for a definitive diagnosis[15].

In our study, all children and adolescents whose arterial pressure was included in risk categories were referred to the *Liguinha de Hipertensão Arterial* of the Federal University of Goiás for clinical examinations in order to verify the presence of arterial hypertension in a more appropriate setting. The confirmed cases have been followed-up by the multidisciplinary team at the institution.

As to the nutritional status, we observed 506 (16.0%) cases of excess weight (overweight + obesity), a tendency that is maintained in both genders, at all ages (16.0% of boys and 15.8% of girls with excess weight); of these, around 5.0% were already obese (5.3% of girls and 4.5% of boys).

These results are lower than the results found by the American *US National Health and Nutrition Examination Surveys* (NHANES III) study that identified 11.0% of obesity in children between four and twelve years of age[31]. In the *Bogalusa Heart Study,* 16.3% and 20.1% were recorded, respectively, for excess weight in the five-to-ten and eleven-to-seventeen age groups[32]. However, this is consistent with other Brazilian studies.

The Investigation on Standard of Living (1996/1997) among children and adolescents between six and eighteen years of age found that 13.9% of the participants had excess weight. Analysis of temporal tendency of the nutritional status among Brazilian young people [six to eighteen years of age] shows an increase in excess weight from 4.1% (1974) to 13.9% (1997), evidencing that this condition tripled during that period of time. The authors further suggest that the rapid weight increase in children and adolescents identifies a tendency that should be monitored[8].

Children whose BMI is over the 75th percentile characterize weight tracking [persistence of relative rankings], a phenomenon in which there is a tendency to maintain the BMI at higher percentiles than those considered healthy in adulthood[33]. This finding is described in the Bogalusa Study in which 77.0 % of the obese children (95th percentile) continued as such in adult life (percentile $\geq$ 30) [34].

In our study the tendency towards excess weight, apparent in both genders and at all ages, provides additional information to the interventional measures that will follow our project. In a state with strong rural influence, with habits and customs very close to those considered of risk, it is vital to understand the causes and intervene in this process of health deterioration.

Obesity can be considered the most important public health problem among children and adolescents. This affirmation is based on the magnitude and ascending temporal curve of its prevalence, on social determination, and on its interaction with other chronic non-transmissible diseases.[31] Additionally, it is known that arterial hypertension progressively increases with Body Mass Index, from a 2.0% prevalence when in the 5th percentile (P 5th) to 11.0% in the 95th percentile (P 95th) of the BMI[35].

Our study showed a positive association ($p < 0.001$) between an increased BMI (overweight and obesity) and elevated blood pressure levels, whether the cut-off point is set in P $\geq$ 90 or in P $\geq$ 95.

There was no statistically significant association between low weight and an increase in blood pressure, which is consistent with the findings of other studies[21,31,36]. Brandão[37] studied children in a suburb of Rio de Janeiro and concluded that the elevation of blood pressure with age depends on the increase in body weight.

The results of this investigation made clear that although 2,801 students (88.4%) attend physical education classes, participation is not associated with a satisfactory BMI. Maybe this is because 23.0% and 42.0% of those assessed participate only once or twice a week, respectively, and only 23.4% of these up to three times a week. Participation in out-of-school physical activities shows that sedentary activities are preferred by 37.9% [of the students], showing that more than one third of those evaluated are at risk as a result of physical inactivity, and a little more than half (56.3%) engage in activities with little calorie-burning potential. No statistically significant correlation was found between any of the investigated physical activities, elevated blood pressure levels, and excess weight. What may possibly explain this result is the methodology used in a study that covers an entire population, which did not include evaluation of type, intensity, or duration of the physical exercise carried out.

The adoption of physical activity, whether in leisure or formal activities, has been associated with and improvement in life expectancy and reduction of

cardiovascular risk. Physical activities help prevent obesity and high blood pressure, improve insulin resistance, and reduce high cholesterol levels, frequently present in children and adolescents[5,38].

Similarly, a study conducted in Argentina with fifteen-year-olds showed that 61.0% of them had insufficient physical activity, but this did not positively correlate with the arterial hypertension frequency detected[39].

The *Youth Risk Behavior Surveillance* also showed that only 29.1% of the American schoolchildren assessed informed that they participate in any type of physical education at school. The reasons reported for this behavior were excessive weight, pregnancy, and cigarette use[40].

The combination of physical exercise and diet is recommended in the management of obesity in children. Nevertheless, participation in types of physical activity that require little effort (watching TV, using the computer or playing video games) is present in all social classes and is directly related to safety issues, to the small effort required, and to the great pleasure these activities provide[41].

Many of the cardiovascular disease risk factors that develop in adults have their roots in habits acquired during childhood. Not only a lifestyle related to eating habits and physical activities is established in this phase of life, but the habit of smoking as well[42-44].

The main factor for a young person to become a smoker is experimentation, both in terms of magnitude and precocity. In a study carried out in twelve capitals of Brazil, the prevalence of experimentation and regular use observed among young people was very high. This justifies the urgency of anti-tobacco campaigns targeting primarily this age bracket, seeking to interrupt the cigarette experimentation process and, consequently, the establishment of regular smoking habits. Along this line, schools are in a privileged position for promoting prevention.

Smoking represents one of the greatest public health challenges, not only because it is a strong cardiovascular risk factor, but also because most smokers formed this habit in preadolescence or adolescence[43]. In our study, information about the use of tobacco and alcoholic beverages by schoolchildren was evaluated by its potential cardiovascular risk, having been reported only by twenty school-age youngsters (0.6%) and failing to prove any statistically significant association.

On the other hand, Achutti et al[43], in analyzing information from the Global Youth Tobacco Survey that investigated adolescents in twelve developing countries including Brazil, found an 8.7% frequency of tobacco use amongst thirteen-to-fifteen year-old schoolchildren. Newer data from worldwide research on smoking among teens that included some Brazilian cities, show that 14.6% of the children between 13 and fifteen years of age who live in Goiânia report smoking regularly, and 37.2% are exposed to cigarette smoke at home.

Similarly, alcoholism in childhood is a social problem that should be thoroughly addressed. Although it is known that most children drink because their friends and schoolmates do, the role of the family environment is fundamental since abusive use of alcohol by family members can stimulate a child's interest in drinking[45].

Alcoholism can be defined as the habitual and frequent intake of alcoholic beverages, divided into several doses during the day, which maintains a permanent alcoholization of the body. Most individuals first experiment with alcohol during their adolescence, approximately at the age of fifteen years[45].

About one third of the schoolchildren interviewed responded positively to the question concerning alcohol use (32.7%). The analysis by age bracket shows an upward [slope] distribution, leading us to suppose that, as the youngster grows older, he/she feels greater freedom to drink The intake of alcoholic beverages could not be associated with the increase in blood pressure since it concerns a very young population whose understanding does not associate the two. It is noteworthy, however, to observe that families facilitate experimentation with alcoholic beverages by children and young people, especially those under twelve years of age (55.0%).

Experimentation, even in small quantities, opens the door to forming habits, and permissiveness, and leads to a mistaken and excessive prominence of this habit. The identification of this group of schoolchildren who have already been introduced to the flavor and use of alcohol, along with the results of a study[44] that shows that 3.0% to 9.0% of the adults in large Brazilian cities are alcohol-dependent confirms the need for implementing preventive measures.

Similarly, research conducted by the *Centro Brasileiro de Informações sobre Drogas Psicotrópicas* (CEBRID) - Brazilian Center of Information on Psychotropic Drugs - with students between ten and twelve years of age in ten capital cities, shows that alcohol is the drug of choice among these children. Around 50% of those evaluated have already used alcoholic beverages, 28.6% had their first drink at home, and in 21.8% of the cases, the drinks were offered by their parents[45].

Onset of drinking among children is taking place at increasingly earlier ages. According to the *I Levantamento Domiciliar sobre o Uso de Drogas Psicotrópicas no Brasil – 2001* (1st Domestic Survey of the Use of Psychotropic Drugs in Brazil), the prevalence of alcohol intake was 33.0% among youngsters twelve to seventeen years of age, and amidst children nine to twelve years of age, 67.0% of Brazilian children have already have some contact with alcoholic beverages[42].

Our project was the first population-based survey to portray the presence of cardiovascular risk determinants in young people of the eastern region of Goiânia. The results we found trace a health profile in which blood pressure reaches levels above those expected for the

respective age groups. The nutritional profile clearly tends towards excess weight, with inadequate physical exercise at school, very little calorie-burning during leisure time, and experimentation with alcohol happening at a very early stage of life.

The endeavor to fill in the gaps of our knowledge makes it possible to not only identify risk factors, but also suggest strategies for addressing the resulting damage.

Barreto et al[46] stress important aspects in health promotion and show that most risk factors operate over the course of a person's life and with varying intensities. They also show that positive changes in lifestyle have a direct effect on health in any phase of life or preexisting health condition, and that the simple dissemination of knowledge is an insufficient factor for sustainable changes in the lifestyle and habits of the population and the sectors of the country involved in health care. Barreto et al further state that behavior and lifestyle of individuals and social groups are largely determined by their physical, socio-economic, and cultural settings.

From this perspective, the proposition of a healthful lifestyle seems to be a major alternative for guaranteeing community health. Individual and collective programs supporting the reduction of modifiable factors and recommending prevention-oriented health measures with self-care and sustainability characteristics are highly recommended[47,48].

It is our strong belief that, if risk factors are established in childhood, their management should begin then as well, with the family as the child's primary social group and a partner in an approach for transformation involving information, practice, and attitudes, and a healthy school environment as a facilitator of healthful daily habits. With a health-promoting background and a strategy of transversal themes, it is possible to claim that monitoring health status at school is a strong criterion for evaluating the efficacy and effectiveness of the measures recommended.

Acknowledgments

Researchers: Ana Lucia I. Oliveira (SPAIS-SES/GO); Magna M. Carvalho (SPAIS-SES/GO); Maria de Fátima Gil (FANUT/UFG); Maria Lucia Carnelosso (SPAIS-SES/GO); Maria Madalena L. S. Sousa (DEME – SEE/GO); Maria do Rosário G. Peixoto (FANUT/*Liga de Hipertensão Arterial*/UFG); Nelma Maria Pereira (Municipal Department of Education of Goiânia); Petronor C. Fonseca (SPAIS - SES/GO); Tânia M. C. Reis (SME/Goiânia); Tenório M. Neto (SUPEF – SEE/GO); Vânia M. Balestra (East Sanitary District - Municipal Department of Health).

Potencial Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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