Dietary Habits and Risk Factors for Atherosclerosis in Students from Bento Gonçalves (state of Rio Grande do Sul)

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Abstract

Background: **Atherosclerotic cardiovascular disease begins its process in early childhood and is influenced throughout life by genetic factors and environmental exposure to potentially modifiable risk factors.**

Objective: **To investigate the prevalence of risk factors for atherosclerosis with emphasis on dietary habits in a predominantly Italian colonization town.**

Methods: **Population-based cross sectional study, involving 590 primary school students aged between 9 and 18 years, with a cluster sample. The following were collected: identification data, family history and personal history, and information regarding students' eating habits. Dietary habits considered inappropriate included: consumption of fast food, sugary snacks, sugar-sweetened beverages and animal fats four or more times a week, and fruits, green vegetables, and leguminous vegetables less than four times a week.**

Results: **The prevalence of overweight among students was 24.6% (n = 145), high blood pressure, 11.1% (n = 65); passive smoking, 35.4% (n = 208); sedentary lifestyle, 52.3% (n = 306), family history of 1st degree disease: hypertension, 21.4%, obesity 36.5%. Food items eaten four or more times a week: fast food, 70.3% (n = 411); sugary snacks, 42.7% (n = 252), sugar-sweetened beverages, 71% (n = 419), and animal fats, 24.4% (n = 143). Food items eaten less than four times a week: fruits, 36.8% (n = 215), green vegetables, 49.5% (n = 292) and leguminous vegetables, 63.7% (n = 374).**

Conclusion: **Interventions are needed to promote changes in students' eating habits: higher level of consumption of fruits, green vegetables and leguminous vegetables, and increased level of physical activity. (Arq Bras Cardiol 2010; 95(2): 166-172)**

Key words: **Food habits; risk factors; atherosclerosis; students; Bento Gonçalves (RS): Brazil.**

Introduction

Atherosclerotic disease begins in childhood and progresses into adolescence and adulthood, and the presence and severity of atherosclerotic lesions are positively and significantly correlated with cardiovascular risk factors. Risk factors include: overweight and obesity, dyslipidemia, hypertension, insulin resistance, sedentary lifestyle and atherogenic diet[1-6].

Overweight in childhood may increase the possibility of heart diseases in adulthood as a result of the early establishment of these risk factors, and control of risk factors is a major strategy for preventing atherosclerotic diseases[2,7].

According to data from the World Health Organization (WHO), cardiovascular diseases are the leading cause of deaths worldwide. It was estimated that 17.5 million people died from these diseases in 2005, representing 30% of all deaths in the world. The forecast for 2015 is that 20 million people die each year from cardiovascular disease. Around 80% of these deaths are occurring in middle and low income countries, and the main causes are smoking, physical inactivity and poor diet[8].

In Brazil, in 2004, there were 86,791 deaths from ischemic heart disease, of which 7,940 were in Rio Grande do Sul[9].

Knowing the risk factors for atherosclerosis in students is essential to assess the need for projects that promote health.

This study is of great importance, since Bento Gonçalves (RS) is devoid of updated data on risk factors in this age group and, especially because, for the first time, the dietary habits of this population are investigated.

The purpose of this study is to investigate the risk factors for atherosclerosis, emphasizing the eating habits in the city of Bento Gonçalves (RS), a city predominantly colonized by Italians in southern Brazil, with specific dietary habits and cultural factors.

Population and methods

This is a population-based cross-sectional study in which we selected a random cluster sample from public and private

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schools in the urban area of the city of Bento Gonçalves (RS), by drawing lots from a list of all municipal, state and private schools. We assessed elementary/middle education students from grades 5 to 8. With the aid of the program EPI INFO (*Statcalc*), it was estimated that for a 9.8% prevalence of obesity observed in Porto Alegre (RS), in a previous study[10] with a confidence level of 95% and margin of error of 2.7%, we would require a sample of 415 students. Considering the possible losses, that number was increased by 30%, totaling 539 students.

The project was approved by the institutional Human Research Ethics Committee. All schools selected were contacted in order to explain the project, by detailing the objectives, activities planned and delivering the draft project to the schools principals and faculty. One school was selected for the pilot study, which enabled adjustments to the data collection tool. After the informed consent was signed by parents and/or guardians and students, they were given a questionnaire with questions pertaining to family history, history of pregnancy and breastfeeding, eating habits and lifestyle. With the questionnaires duly filled up, we performed anthropometric and blood pressure checks on the students.

In order to evaluate body weight, we used calibrated portable electronic scales with capacity for up to 120 kg. The children were weighed wearing only light clothing and barefoot, standing up at the center of scale, with arms outstretched to the sides, without moving. To measure their height we used an unextensible tape measure with a precision of 0.1 cm set on smooth walls without toeboard and square. The children were placed upright, erect, with feet parallel, and heels, shoulders and buttocks touching the wall. To measure blood pressure, we used aneroid blood pressure monitors, manometer graded from 0 to 300mmHg. The blood pressure was checked according to the I Guideline for the Prevention of Atherosclerosis in Childhood and Adolescence[11].

Body Mass Index (BMI) was determined through the body weight/squared height ratio in kg/m^2. The nutritional status assessment was made by means of standard curves of BMI for age as recommended by the World Health Organization (WHO, 2007 - www.who.int / childgrowth) and the cutoff points used for classification of overweight (between percentiles of 85 and 97) and obesity (above the 97 percentile), according to the guidelines of the World Health Organization of 2007. For the presentation and discussion of results, overweight and obesity were grouped into overweight.

To investigate the dietary habits, we administered a dietary frequency questionnaire developed for this population.

Information was collected regarding the number of daily meals, eating site, origin of snacks eaten while in school , food item consumed in these snacks, frequency of consumption of animal fats (butter, lard, bacon), margarine, mayonnaise and vegetable oils, frequency of consumption of fast food (breaded food, burgers, pizza, hot dogs, French fries, fried pastry, cheese burgers, and ready-made soups), green vegetables (leafy vegetables/vegetables), fruits, foods with high contents of carbohydrates (rice, pasta, cassava, potatoes, polenta (boiled cornmeal), bread, crackers), meats/eggs, dairy products, leguminous vegetables, sugar-sweetened beverages (regular soft drinks, juice powders, juice concentrates and fruit juices). Improper dietary habits were consumption of fast food, sugary snacks (candies, sandwich cookies, chocolate and snacks), sugar-sweetened beverages, margarine, mayonnaise and animal fats four or more times a week, and consumption of fruits, green vegetables and leguminous vegetales less than four times a week.

The lifestyle was evaluated based on sedentary hours (TV watching time, videogame, computer) and weekly hours of physical activity (sum of weekly hours devoted to monitored regular exercising and unmonitored physical activities). Physical activities performed less often than three times a week and more than five hours watching TV/playing video game and using computer[11] were considered improper.

Data were stored in the database SPSS version 15.0. Qualitative variables were described from the absolute and relative frequency, and quantitative variables were described by using the mean and standard deviation or median and interquartile ranges. A confidence interval of 95% was considered for clusters. The groups were compared using the chi-square and Student t tests, assuming a critical alpha error of 0.05.

Results

We evaluated 590 students from ten public and private schools. The sample consisted of 41.5% (n = 245) of boys and 58.5% (n = 345) of girls, aged 9 and 18. Most students, 93.2% (n = 550), attended school in the morning, of which 9.8% (n = 58) were from private schools, 35.8% (n = 211) from municipal schools and 54.4% (n = 321) from state schools. Most parents had not completed elementary/middle education: mothers 42.9% (n = 240) and fathers 45.1% (n = 332) (Table 1).

As for dietary habits, the average number of meals that students had per day was 4.4 (SD: 0.9), and 72.2% (n = 426) were used to having breakfast. The frequency of weekly intake of the snack provided by the schools was three meals (1.5).

Out of the 590 students evaluated, 75.9% (n = 443) had lunch at home. Leguminous vegetables, green vegetables and fruits had a median frequency of consumption of 3 (1.5), 2 (4.7) and 5 (3.7), respectively. The most consumed meat was beef, with a frequency of 3 (2.4). As for fats, 50% of students consumed vegetable oils up to five times a week and 25% did not consume margarine, animal fats and mayonnaise. Milk and dairy products were consumed by 50% of students on a weekly basis, up to five times a week. Out of those students who participated in the study, 25% did not consume eggs. Unhealthy foods, such as fast food, sugary snacks and sugar-sweetened beverages, were taken on weekly basis, 5 (3.8), 5 (3.7) and 3 (2.5) times a week, respectively (Table 2).

Among the risk factors for atherosclerosis, the following rates were found: overweight, 24.6% (n = 145), 16.3% overweight and 8.3% obesity; active smoking, 0.5% (n = 3); passive smoking, 35.4% (n = 208); while 52.3% (n = 306) of students exercised less than three times a week, and 57.5% (n = 335) spent more than five hours a day watching TV/playing videogame/using the computer. High blood pressure levels on examination were found in 11.1% (n = 65) of students.

Table 1 - General characteristics of the sample studied

Variables	n (%)
Students	590 (100)
Male	245 (41,5)
Female	345 (58,5)
Age	
9 to 13 years	459 (77,8)
14 to 18 years	131 (22,2)
School	
State	321 (54,4)
Municipal	211 (35,8)
Private	58 (9,8)
Shift	
Morning	550 (93,2)
Afternoon	40 (6,8)
Father's education level	
Incomplete elementary/middle education	232 (45,1)
Complete elementary/middle education	88 (17,1)
Incomplete high school	29 (5,6)
Complete high school	121 (23,5)
Incomplete higher education	12 (2,3)
Higher education or more	33 (6,4)
Mother's education level	
Incomplete elementary/middle education	240 (42,9)
Complete elementary/middle education	92 (16,5)
Incomplete high school	26 (4,7)
Complete high school	136 (24,3)
Incomplete higher education	27 (4,8)
Higher education or more	38 (6,8)

Table 2 - Dietary habits of students

Variables	
Number of daily meals	4,44 ± 0,98
Has breakfast	426 (72,2)
No. of times consuming lunch provided by school	3 (1;5)
Lunches at home	443 (75,9)
Number of times/week consuming:	
leguminous vegetables	3 (1;5)
rice	4 (3;7)
green vegetables	2 (4;7)
fruits	5 (3;7)
beef	3 (2;4)
chicken	2 (1;3)
fish	0,48 ± 0,78
egg	1 (0;2)
vegetable oils	5 (2;7)
animal fats*	1 (0;3)
margarine	2 (0;5)
mayonnaise	1 (0;3)
milk and dairy products	5 (3;7)
sugar-sweetened beverages †	5 (3;7)
fast food ‡	5 (3;8)
sugary snacks §	3 (2;5)

*Average + SD, n (%) Median (1st quartile, 3rd quartile). *Animal fats: butter, lard, cream/heavy cream, bacon. † Beverages containing sugar: soft drink, juice powders, juice concentrates, juice with sugar. ‡ Fast food: French fries, fried pastry, breaded foods, hot dogs, pizza, cheeseburger, ready-made soups. § Sugary snacks: candies, sandwich cookies, chocolate, crisps.*

Consumption of fast food four times or more per week was reported by 70.3% (n = 411) of students. Additionally, we found consumption rates greater than or equal to four times per week for sugary snacks, 42.7% (n = 252); sugar-sweetened beverages, 71% (n = 419); animal fats, 24.4% (n = 143); margarine, 37.5% (n = 218) and mayonnaise, 17.1% (n = 99).

As for family history of 1st degree diseases, hypertension and obesity had the highest prevalence rates: 21.4% (n = 126) and 36.5% (n = 196), respectively (Tab.3).

Discussion

This population-based cross-sectional study investigated the prevalence of risk factors for atherosclerosis with emphasis on dietary habits in a region predominantly colonized by Italians and found high rates of risk factors in this population. The prevalence of overweight in the sample studied was 24.6% (16.3% overweight and 8.3% obesity). This finding is similar to a study conducted in Capão da Canoa (RS) with 719 students aged 11 to 13, in which the prevalence of overweight was 24.8%[12]. In other national polls, the findings show the prevalence of overweight ranging from 7.8% to 26.3%: in Recife (PE), 7.8%; in João Pessoa (PB), 19.9%; in Piracicaba (SP), 21%; in Florianopolis (SC), 22.1% to 26.2%; and in Pelotas (RS), 26.3%[13-17]. In the city of Bento Gonçalves (RS), the prevalence of obesity from 1990 to 1991 was 6.33% compared to the current prevalence, an increase of 1.97%, but this study was not population-based[18]. In Porto Alegre (RS), the prevalence of overweight was 27.6% (17.8% overweight and 9.8% obesity)[10], higher than this study.

An international study linking childhood BMI and the risk of coronary events in adulthood reported that each unit increased in BMI increases the likelihood of future coronary events, and this association increases with age[2].

Another study on overweight and coronary heart disease evaluated adolescent-related data in 2000 when the prevalence of overweight was 16.7% in boys and 15.4% for girls, to forecast the proportion of obese men and women in 2020. The prevalence of obesity was estimated at 30% to 35% for men and 34% to 44% for women, compared with the year of the study, which was 25% and 32%, respectively. Due to

Table 3 - Risk factors for atherosclerosis

Variables	n (%)
Overweight	96 (16,3)
Obesity	49 (8,3)
Excess weight	145 (24,6)
Passive smoking	208 (35,4)
Active smoking	3 (0,5)
Physical activity less than 3 times a week	306 (52,3)
Hours of TV watching, video game playing and computer more than 5 hours a day	335 (57,5)
High systemic blood pressure	65 (11,1)
Improper dietary habits	
Fruits < 4 times a week	215 (36,8)
Green vegetables < 4 times a week	292 (49,5)
Leguminous vegetables < 4 times a week	374 (63,7)
Fast food * > 4 times a week	411 (70,3)
Sugary snacks, † > 4 times a week	252 (42,7)
Sugar-sweetened beverages ‡ > 4 times a week	419 (71)
Animal fats § ≥ 4 times a week	143 (24,4)
Margarine ≥ 4 times a week	218 (37,5)
Mayonnaise ≥ 4 times a week	99 (17,1)
Family history	
1st degree relative with diabetes	16 (2,7)
1st degree relative with hypertension	126 (21,4)
1st degree relative with hypercholesterolemia	48 (8,1)
1st degree relative with obesity	196 (36,5)
1st degree relative with cardiopathy/ischemic disease	25 (4,2)

**Fast food: French fries, fried pastry, breaded foods, hot dogs, pizza, cheeseburger. † Sugary snacks: candies, sandwich cookies, chocolate, crisps. ‡ Sugar-sweetened beverages: regular soft drinks, juice powder, juice concentrates, juice with sugar. § Animal fats: butter, lard, cream/heavy cream, bacon.*

this increase in overweight, the annual increase of coronary heart disease rate was estimated at 15% for the year 2020, with no increased prevalence of obesity[5]. These estimates are disturbing if we think on a future forecast using the prevalence of overweight of 24.3% in the sample. This result reveals the need for emergency strategies for these children and adolescents, as well as the development of programs designed prevent overweight and obesity and associated diseases.

Increased blood pressure levels were present in 11.1% of students assessed. This percentage is higher than that found in the study conducted from 1990 to 1991 by Gerber and Zielinski[18], which was 5% for systolic blood pressure levels and 3.2 % for diastolic blood pressure levels. In Cuiabá (state of Mato Grosso), in 2005, we found a prevalence of high blood pressure of 6.1% and, in Recife (PE), from 2004 to 2005, a prevalence of 11.1%[13,19]. Epidemiological studies of primary hypertension in childhood and adolescence conducted in Brazil reported a prevalence ranging from 0.8% to 8.2%[11], indicating that the students from Bento Gonçalves (RS) have blood pressure levels above the range found by previous epidemiological studies conducted in Brazil. However, it is important to emphasize that in our study, we only performed an assessment of blood pressure levels. Therefore, it was not possible to establish the diagnosis of hypertension. Instead, we only drew attention to these high levels.

The study "Trends of Increased Blood Pressure in Children and Adolescents," from 1963 to 2002, assessed children and adolescents from aged 8 to 17, participating in the studies NHES, HHANES and NHANES performed during this period, and concluded that systolic and diastolic pressure levels are rising and these new findings have implications for cardiovascular disease and represent a burden for public health[20].

The high prevalence of 52.3% of students performing physical activities less than three times a week and the number of hours devoted to sedentary behaviors (watching TV/playing video game/using the computer), 57.5%, observed in this study, are other important risk factors that may contribute to obesity. Research shows that TV may influence the diet of children and adolescents as observed in a study conducted with children aged 2 to 11 and adolescents aged 12 to 17. This study reported that from the total calories of the foods advertised on TV, 46.1% to 49.1% of them originated from sugar[21].

In a study conducted in Recife (PE), the prevalence of physical inactivity was 41.5%, which is below the one found is this study. Sedentary activities, like watching TV/playing videogames/computer games for more than three hours a day, were prevalent in 43% of a sample of children in Rio de Janeiro (RJ). Pelotas (RS), TV-watching hours averaged 3.5h (+2.6h); almost 30% of children and adolescents watched TV for four or more hours a day[13,17,22].

The American Academy of Pediatrics recommends limiting TV-watching time for children to one or two hours of quality programming[23].

A longitudinal study with pre-adolescents and adolescents in the United States showed that for both boys and girls, the yearly increase in BMI was higher in those who reported the highest number of TV-watching and videogame-playing hours during that year[24].

History of family diseases can also be considered a risk factor for atherosclerosis. In the population studied, we observed a high prevalence of 1st degree family diseases, especially hypertension, obesity and hypercholesterolemia. Although diabetes mellitus and ischemic heart disease have shown low prevalence, it should be noted that students' parents were mostly young adults, and that this prevalence could have higher values if the parents belonged to an older age group.

Several studies point out that the risk of type II diabetes and cardiovascular disease are detectable in childhood, and that these diseases seem to share risk factors, including obesity and dyslipidemia. A simple way to detect any risk for both diseases is to examine the family history. Family history can be part of the approach for screening children at risk of diabetes and cardiovascular disease and its investigation must include campaigns to reduce their risk factors[25].

The prevalence of smoking among the students was (0.5%) and passive smoking was prevalent in 34.5%, and this is a concerning data due to the harmful effects caused by cigarette smoke. A study conducted in the Metropolitan Region of Rio de Janeiro (RJ) reported a prevalence of passive smoking of 57.3%[22]. In Recife (PE), the prevalence was 27.7%[13]. Although the events related to atherosclerosis do not occur in childhood and adolescence, there is ample evidence to suggest that regular smoking is associated with the onset of chronic atherosclerosis[26].

In Brazil, recent studies report that smoking is present in 3% to 12.1% of adolescents[11].

The risk factors presented earlier become more relevant when faced with the eating habits of students in the sample, who reported a high frequency of consumption of fast food, sugar-sweetened beverages and sugary snacks, and a lower frequency in the consumption of fruits, green vegetables and leguminous vegetables. It is known that the consumption of fruits and green vegetables should be daily, even taking an average of four times per week as optimal for this study, we observed that the frequency of consumption of these foods was lower than the average for many students in the sample.

Similar results were found in previous studies[15,27-30].

Research conducted in the United States, using nationally representative data to examine the usual diet of children, tested the hypothesis that consumption of fast food adversely affects dietary factors linked to obesity. Fast food remained positively and significantly associated with total energy, total fat, saturated fat, total carbohydrates, added sugar, sugar-sweetened beverages and energy density of alcoholic drinks[31].

As for the consumption of sugar-sweetened beverages, it was observed that the vast majority, or 71% of students, consumed these beverages four or more times a week.

Studies show that the consumption of sugar-sweetened beverages is associated with increased weight gain. A randomized controlled pilot study with adolescents aged 13 to 18 concluded that the reduction in consumption of alcoholic beverages has a beneficial effect on body weight[32]. The Bogalusa Study assessed, among other aspects, changes in the consumption of sugar-sweetened beverages over two decades, in children aged 10, and concluded that the percentage of children consuming such beverages decreased from 1973 to 1994, particularly soft drinks and coffee with sugar. However, consumption of tea with sugar, fruit juices, soft drinks and coffee with sugar increased significantly[33].

Also concerning the dietary habits of schoolchildren, we can mention two important points: most of them had breakfast and lunch at home.

A study conducted in Pelotas (RS) reported that the number of meals was directly associated with overweight, that is, the lower the number of meals, the greater was the frequency of overweight, which is similar to this study[17].

Researchers believe that the habit of having breakfast can be an important marker of a very healthy lifestyle in young people, and that frequent breakfast may bring an important effect on the prevention of weight gain. This fact was observed in the sectional and prospective study, which linked the frequency of breakfast consumption to changes in body weight in adolescents[34].

In this population-based cross-sectional study, one should consider some limitations. This type of study does not involve time monitoring, which could build better associations between dietary habits and other risk factors. Nor does it assess changes in dietary behavior and lifestyle. Another possible limitation of cross-sectional studies and the actual instrument used is the omission of information or misinformation about dietary habits, since the questionnaire was answered at home without the presence of a researcher.

Finally, it is the duty of all - parents, educators and health professionals - to ensure the health of children and adolescents through attitudes consistent with the guidelines established to promote health and reduce morbidity and mortality in our environment, changing therefore, the worrying predictions made by the World Health Organization.

Potential Conflict of Interest

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

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Study Association

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