Lifestyle and Cardiovascular Health in School Adolescents from São Paulo

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Abstract

Background: Cardiovascular disease is the leading cause of mortality worldwide. There is evidence demonstrating the association of this disease with cardiovascular risk factors related to lifestyle, incorporated in adolescence.

Objective: To identify, in adolescents, the prevalence of overweight and lifestyle factors associated with risk for developing cardiovascular diseases, and the factors that influence them.

Methods: It was conducted an observational study of individual cross-sectional data with adolescents enrolled in public and private schools in São Paulo, covering grades 5 to 8 of elementary school. The information was obtained through the application of an anonymous questionnaire and weight and height measurements.

Results: 2,125 adolescents with mean age of 12.9 years were studied. From the total sample: 14.4% to 32.1% did not practice sports or competitions; 56.0% to 73.6% remained more than two hours watching TV, playing video game or working on the computer; approximately 80% consumed fruits and vegetables improperly; 34.9% to 45.3% reported high salt consumption; and 60.9% to 74.4% reported consumption of soft drinks. Prevalence of overweight ranged from 18.7% to 41.6%.

Conclusion: In school adolescents, this study found high prevalence of risk factors associated with the development of cardiovascular disease in adults. Further studies are required to better understand how these risk factors are related and thus enable the implementation of preventive measures in adolescence in order to prevent cardiovascular disease in adults. (Arq Bras Cardiol. 2010; [online]. ahead print, PP.0-0)

Key words: Adolescent; life style; overweight; risk factors.

Introduction

In Brazil, cardiovascular diseases (CHD) were the main cause of mortality in 2004. In São Paulo, they were the most frequent cause of deaths from 2001 to 2004. Epidemiological data also show that ischemic heart disease (IHD) and cerebrovascular disease (CVD), both arising from the process of atherosclerosis, are the main causes of this group of pathology[1,2].

The Framingham heart study and subsequent works, including Brazilian studies, reveal that there is an association between atherosclerosis and exposure to risk factors, both biological and behavioral factors, and others such as education, income, occupation, condition of employment/unemployment, psychosocial factors, ethnicity and urbanization[3,4]. It is recognized in literature that: IHD is a multifactor disease; the process of atherosclerosis begins early in life; there is a lag time between exposure to risk factors and clinical manifestations of IHD[5]; risk factors combine together; and there is a high degree of persistence in adulthood of risk factors present in childhood and/or adolescence[6,7]. Genetic inheritance[8], unbalanced diets rich in saturated and trans fats and refined carbohydrates, poor in fruits and vegetables and with substantial amounts of salt[9], physical inactivity[10], among others, are risk factors that contribute to the development of cardiovascular diseases. Evidence has revealed the benefits of early recognition of cardiovascular risk factors with the aim of preventing cardiovascular diseases.

The purpose of this study was to identify the risks associated with the development of cardiovascular disease in adolescents enrolled in grades 5 to 8 of elementary school in public and private schools from two districts in the city of São Paulo, and the factors that influence them.

Methods

This is a cross sectional observational study of individual data performed with adolescents enrolled in public and private schools from Central and Midwest regions of São Paulo in grades 5 to 8 of elementary school in the years 1999, 2000 and 2001. The sample was taken from the archive of

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the Department of Education of the State of São Paulo[11]; the selection was made by drawing lots of classrooms using the statistical program EPI-INFO, version 6.04, option EPITABLE CALCULATOR and the commands SAMPLE/RANDOM NUMBER LIST; the option for drawing lots of classrooms was justified by the need to obtain a broader universe of students from these areas. The sample was not drawn by lots of schools due to the size differences between them, which would hamper the weighted representation of school units. Students were not drawn by lots because there was no standard identification for that set.

Figure 1 presents the characteristics of the sample - the number of classrooms in these region accounts for 25% of all classrooms in the city of São Paulo and the regions have an equal number of public and private institutions. The inclusion criteria were the agreement of the selected schools to participate in the project and that of the adolescents to be volunteers. The centers involved were: the Heart Institute (INCOR) from *Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo* and the Department of Education of the State of São Paulo, through schools from the school districts mentioned above.

The information was obtained through a pre-coded anonymous questionnaire[12], with Y/N questions divided into six sections: demographic data, family history (parents) of myocardial infarction, hypertension and/or diabetes mellitus, physical activity, dietary habits, use of alcohol and tobacco. This questionnaire was submitted to a pre-test in order to verify the understanding of the vocabulary and the clarity of the meanings. The initial questionnaire was redrafted after a review of the issues accounting for 7% to 10% of missing data, in order to revise the language, enter some questions and correct inconsistencies and ambiguities. The request for answering the questionnaires and the measurements of height and weight were made by 29 students from the *Faculdade de Medicina da Universidade de São Paulo* enrolled in the course "Practice of Health Education and Cardiovascular Epidemiology" (MCP0365), who were trained to conduct the questionnaire (in order to answer any questions from students without inducing answers and recommend them not to answer the questions they did not know) and perform the weight and height measurements according to instruments and procedures recommended for field studies (digital electronic anthropometric scale, with clothes, without coats and shoes).

The variables and their categories

Color

Self-reported data, as recommended by the Brazilian Institute of Geography and Statistics (IBGE)[13], including the following: Yellow, White, Indigenous, Brown and Black.

Housing conditions

Measured by the number of people per bedroom (PPB): lower density: PPB < 1; regular density: PPB from 1 to 1.9; higher density: PPB > 2.

History

Family history (FH) of myocardial infarction, hypertension and/or diabetes mellitus considering biological parents: Yes and No options.

Eating habits

Assessed by the frequency, on the previous day, of the consumption of food divided according to their main composition. Three markers were chosen and the cutoffs were adjusted[14]: Consumption of fruits and vegetables: servings < 6 and ≥ 6; Salt consumption, measured by a 0-15 score built by the answers concerning the intake of snacks, canned food and adding salt to food, where Low corresponds to a < 5 score, Medium to a score between 5 and 10, and High to a score > 10; and Sugar consumption: soft drinks, Yes and No options.

Physical activity

Measured by the frequency of practice of routine physical activities involving energy expenditure. Methodological difficulties and lack of standardized instruments for measuring this variable in epidemiological studies justified the choice for analyzing consistent responses: Practice of sports and/or competition: Yes and No options; Time spent watching TV, playing video games and entertaining or working on the computer: < 2 hours and > 2 hours options.

The analysis of the variables "intake of alcohol" and "tobacco" was the subject of a previous publication[15].

Anthropometry

The body mass index (BMI) was calculated and the cutoff point for overweight was the percentile 85[16].

Prevalence rates and confidence intervals of the categories of the variables considered as risk factors to the development of cardiovascular diseases were calculated[17].

This study was approved by the Ethics Committee for Analysis of Research Projects from *Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo*, under No. 277/01. Parents or adolescents' guardians signed an "Informed Consent" authorizing the adolescents to engage in this work.

Results

The sample included 2,125 adolescents aged between 10 and 19 with mean of 12.9 +/- 1.3 and median of 13, consisting of 50.5% of girls.

Tables 1 and 4 show the demographic characteristics and the family history (FH) of myocardial infarction, diabetes mellitus and/or hypertension. The highest percentage of adolescents reported themselves as white and this subgroup had the greatest representation in private schools. Note that the highest the school grade was, the lowest was the percentage of adolescents that reported themselves as brown and black; note also that the highest percentage of adolescents enrolled in private schools belonged to subgroups with smaller and regular number of persons per bedroom, and that brown and black subgroups represented the highest percentage of the subgroup with the highest number of persons per bedroom. The presence of FH varied from 32.2% to 52.3% - mainly in

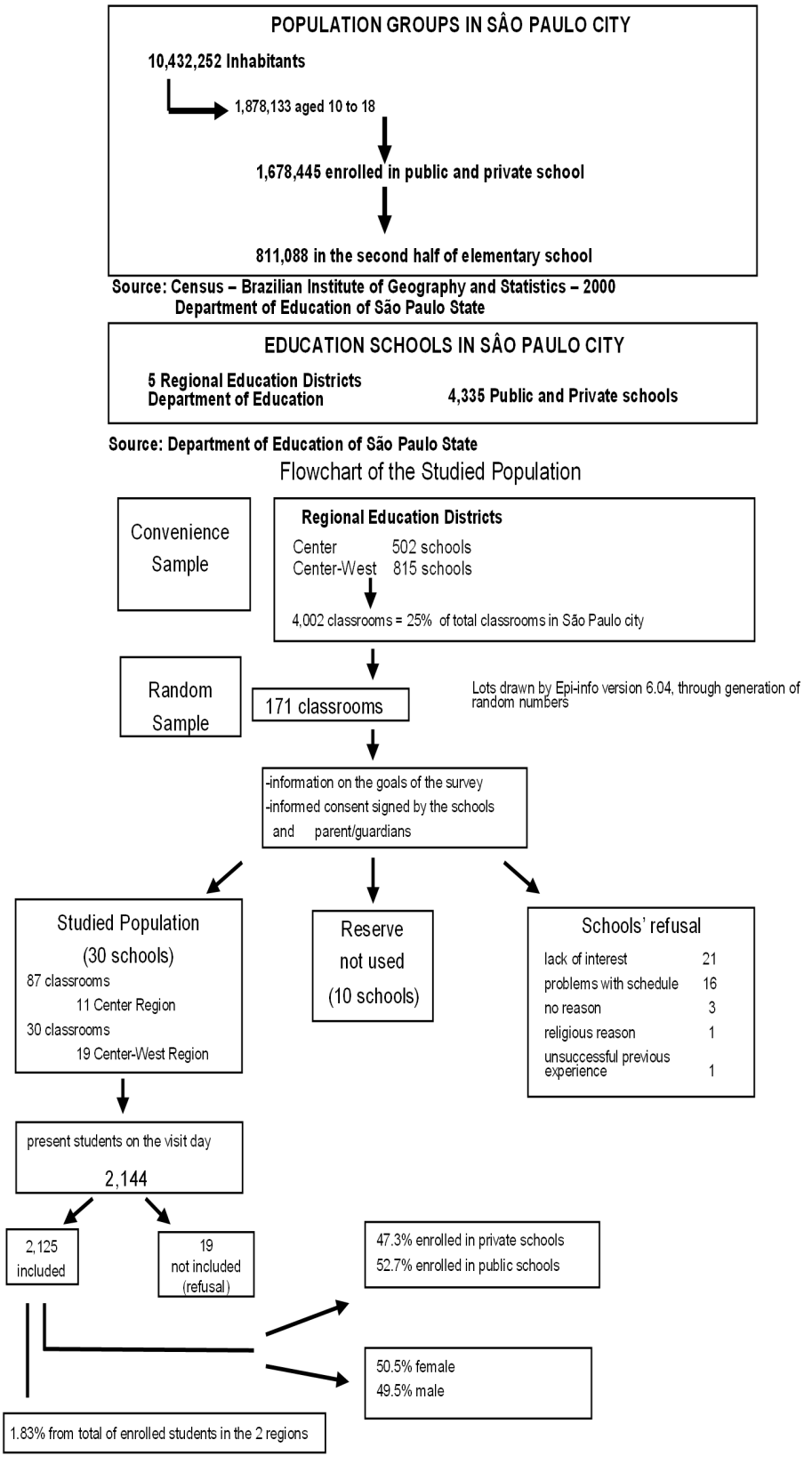

Figure 1 - Flowchart of the studied population.

Table 1 - Prevalence and confidence interval of selected variables by sex, public or private school and grade, in adolescents from two school districts in the city of São Paulo, in 1999, 2000 and 2001

	*F	†M	‡Pri	§Pub	//5	¶6	#7	**8ª
Color								
N	1037	990	966	1063	474	544	524	483
Yellow	4.6 (3.4 – 6,0)	4,2 (3,1 – 5,6)	6,0 (4,6 – 7,6)	3,0 (2,1 – 4,1)	4,0 (2,5 – 6,0)	4,9 (3,3 – 7,0)	5,1 (3,4 – 7,3)	3,5 (2,1 – 5,4)
White	63.7 (60.7 – 66.6)	66.0 (63.0 – 68.9)	79.7 (77.0 – 82.1)	51.4 (48.5 – 54.4)	60.5 (56.0 – 64.8)	58.2 (54.0 – 62.3)	70.8 (66.8 – 74.5)	70.6 (66.4 – 74.5)
Indigenous	2.0 (1.2 – 3.0)	2.9 (2.0 – 4.1)	2.0 (1.3 – 3.1)	2.8 (1.9 – 3.9)	3.1 (1.8 – 5.0)	3.3 (2.0 – 5.0)	1.9 (0.9 – 3.3)	1.4 (0.6 – 2.8)
Brown	22.3 (19.9 – 24.9)	17.8 (15.5 – 20.3)	9.9 (8.1 – 11.9)	29.4 (26.7 – 32.2)	20.6 (17.2 – 24.5)	23.3 (19.9 – 27.0)	18.8 (15.7 – 22.4)	17.1 (14.0 – 20.7)
Black	7.2 (5.7 – 8.9)	8.8 (7.2 – 10.7)	2.2 (1.4 – 3.3)	13.2 (11.3 – 15.4)	11.6 (8.9 – 14.7)	10.1 (7.7 – 12.8)	3.2 (1.9 – 5.0)	7.2 (5.1 – 9.8)
Number of people per bedroom								
N	1032	972	968	1038	461	539	526	478
< 1	16.1 (14.0 – 18.5)	16.2 (14.0 – 18.6)	24.3 (21.7 – 27.1)	8.5 (6.9 – 10.4)	13.0 (10.1 – 16.3)	13.1 (10.5 – 16.2)	22.0 (18.6 – 25.7)	16.3 (13.2 – 19.8)
1 to < 2	50,5 (47,5 – 53,6)	50,6 (47,4 – 53,7)	63,9 (60,8 – 66,9)	38,1 (35,2 – 41,1)	47,7 (43,1 – 52,2)	46,1 (42,0 – 50,4)	55,8 (51,6 – 60,1)	52,3 (47,8 – 56,7)
≥ 2	33,2 (30,4 – 36,1)	33,1 (30,2 – 36,1)	11,6 (9,7 – 13,8)	53,2 (50,2 – 56,3)	39,2 (34,8 – 43,7)	40,6 (36,5 – 44,8)	22,0 (18,6 – 25,7)	31,3 (27,3 – 35,6)
Family history of myocardial infarction, diabetes and/or hypertension								
N	790	764	784	770	354	408	398	393
Yes	40,6 (37,2 – 44,0)	34,4 (31,1 – 37,8)	32,2 (29,0 – 35,6)	42,9 (39,5 – 46,5)	36,7 (31,8 – 41,8)	37,9 (33,3 – 42,7)	35,4 (30,8 – 40,2)	40,2 (35,4 – 45,1)

** F - female; † M - male; ‡ Pri - private school; § Pub - public school; // 5 - grade 5; ¶ 6 - grade 6; # 7 - grade 7; ** 8 - grade 8.*

the subgroups of female from public schools and students from higher grades.

Tables 2 and 4 show the characteristics related to lifestyle. Absence of practice of sports and competitions ranged from 14.4% to 32.1% and was higher in female subgroups and public schools; worthy of note is the fact that 56.0% to 70.5% of adolescents remained more than two hours watching TV, playing video game and entertaining or working on the computer; about 80% of adolescents consumed fruits and vegetables improperly, and increased salt consumption ranged from 34.9% to 45.3%, while consumption of soft drinks ranged from 60.9% to 74.4%.

Tables 3 and 4 present BMI values equal to or greater than the percentile 85. The highest percentages were found in boys from private schools and in the indigenous subgroup; these values follow a downward trend with the progression of grades; such trend was more conspicuous in boys from grade 8.

Discussion

This work is the descriptive phase of a cross-sectional observational study of individual data. This type of study is limited by temporality, because it assess at the same time both exposure and effect. However, it has a good descriptive power and an operating cost easily absorbed, and it is simple to implement and suitable for generating hypotheses that can be tested in analytical studies with greater evidence strength; other limits of the work are the use of questionnaires for data collection, which involves measurement accuracy, and the sample, composed of school adolescents from two school districts in the city of São Paulo.

The sex distribution was very close to existing distributions for the same age group in São Paulo for the years 1999, 2000 and 2001[18].

The distribution of color was different compared to IBGE census data for the population living in São Paulo in 2000[19]. Note that these adolescents reported themselves more as yellow, black and indigenous than brown. Some explanations can be the difference between the samples and/or a greater awareness of belonging to a group due to social movements organized in recent years with the purpose of asserting identities and protecting rights.

The findings from this study concerning genetic inheritance suggest the following possibilities: girls are more observers and/or more involved in family dynamics comparing to boys; the subgroup from grade 8 hold a greater amount of information or the parents of these adolescents are presumably older, where the prevalence of the diseases studied is greater; and parents of public school adolescents are more prone to the diseases investigated and/or become ill more often because they face

Table 2 - Prevalence and confidence interval of selected variables by sex, public or private school and grade, in adolescents from two school districts in the city of São Paulo, in 1999, 2000 and 2001

	*F	†M	‡Pri	§Pub	// 5ª	¶6ª	#7ª	**8ª
Practice of sports and/or competition								
N	1000	964	943	1023	448	535	511	469
No	32.1 (29.2 – 35.0)	14.4 (12.3 – 16.7)	18.4 (16.0 – 21.0)	28.0 (25.3 – 30.8)	20.5 (16.9 – 24.4)	28.2 (24.5 – 32.1)	19.9 16.6 – 23.6)	24.5 (20.7 – 28.5)
Hours spent watching TV, playing video game or using the computer								
N	1033	999	973	1061	480	546	523	482
More than 2	70.5 (67.7 – 73.2)	65.9 (62.9 – 68.8)	67.9 (64.9 – 70.8)	68.6 (65.7 – 71.3)	64.3 (60.0 – 68.5)	67.7 (63.7 – 71.5)	73.6 (69.7 – 77.2)	67.0 (62.7 – 71.1)
Consumption of fruits and vegetables								
N	1055	1022	999	1080	485	565	534	492
< 6 servings	83.8 (81.5 – 86.0)	81.1 (78.6 – 83.4)	82.8 (80.4 – 85.1)	82.2 (79.8 – 84.4)	84.1 (80.6 – 87.1)	83.3 (80.1 – 86.2)	79.9 (76.4 – 83.2)	83.1 (79.6 – 86.2)
Salt consumption								
N	862	818	759	923	405	450	424	401
Score ≥ 5	37.2 (34.0 – 40.5)	41.9 (38.5 – 45.3)	41.6 (38.1 – 45.1)	37.8 (34.7 – 40.9)	40.7 (36.0 – 45.5)	45.3 (40.7 – 49.9)	36.7 (32.3 – 41.4)	34.9 (30.3 – 39.6)
Consumption of soft drinks								
N	1036	1013	981	1070	488	558	518	484
Yes	61.1 (58.1 – 64.0)	72.5 (69.7 – 75.2)	63.8 (60.7 – 66.7)	69.4 (66.6 – 71.2)	67.2 (62.9 – 71.2)	70.2 (66.3 – 73.9)	67.9 (63.8 – 71.8)	60.9 (56.5 – 65.2)

**F - female; †M - male; ‡Pri - private school; §Pub - public school; // 5 - grade 5; ¶6 - grade 6; #7 - grade 7; **8 - grade 8.*

Table 3 - Prevalence and confidence interval of the categories of body mass index considered as risk for cardiovascular health by sex, public or private school and grade, in adolescents from two school districts in the city of São Paulo, in 1999, 2000 and 2001

	Private					Public					Total
	Subtotal	// 5	¶6	#7	**8	Subtotal	//5	¶6	#7	**8	
N	446	61	98	167	120	549	171	175	91	112	995
*F	22.6 (18.9 – 26.7)	26.2 (16.3 – 38.3)	23.4 (15.8 – 32.6)	23.3 (17.4 – 30.2)	19.1 (12.8 – 26.9)	21.6 (18.3 – 25.2)	22.8 (16.9 – 29.5)	22.2 (16.5 – 28.9)	21.9 (14.3 – 31.3)	18.7 (12.3 – 26.7)	22.1 (19.6 – 24.7)
N	434	56	89	157	132	516	164	160	76	116	950
†M	29.7 (25.5 – 34.1)	39.2 (27,1 – 52,4)	32.5 (23.4 – 42.8)	28.6 (22.0 – 36.1)	25.0 (18.1 – 32.9)	22.4 (19.0 – 26.2)	25.0 (18.8 – 32.0)	20.6 (14.8 – 27.4)	25.0 (16.2 – 35.6)	19.8 (13.3 – 27.8)	25.7 (23.0 – 28.6)

**F - female; †M - male; // 5 - grade 5; ¶6 - grade 6; #7 - grade 7; **8 - grade 8.*

great difficulties in accessing health services. The findings from this study are higher than those of a study conducted in Brazil with 1,501 schoolchildren aged 6 to 16, which reveals 27.9% of positive family history of cardiovascular diseases[20]. The discrepancies can be explained by methodological differences and/or the variability in the prevalence of IHD in developing countries, which are attributed to the different degrees of exposure to various risk factors, including ethnicity, low socioeconomic status and urbanization[21].

Concerning eating habits, a significant portion of adolescents from this sample had an improper dietary standard. The results are consistent with those from other studies, even with the limits for comparisons due to differences in methodology. In Brazil, an epidemiological survey with 1,450 students shows a "very improper" consumption of fruits, vegetables and fibers, and a daily consumption of snacks and soft drinks almost in 64.8%, 25.9% and 32.9% of the sample, respectively[22]. Studies based on data from the Household Budget Survey conducted by the IBGE estimate that household availability of fruits and vegetables accounts for 4.6% of total calories[23], which is below the percentage recommended in the Dietary Guide for the Brazilian population, which sets a minimum consumption of fruits and vegetables which corresponds to 9% to 12% of a diet of 2,000 kcal/day[24]; and a declining trend in the consumption of fruits and vegetables, increasing consumption of food with high salt content and increasing availability of soft drinks were detected in households of metropolitan areas in two consecutive periods[25]. In the United States, 20.1% of

Table 4 - Prevalence and confidence interval of selected variables by color in adolescents from two school districts in the city of São Paulo, in 1999, 2000 and 2001

	Yellow	White	Indigenous	Brown	Black
Number of people per bedroom					
N	88	1253	47	381	153
< 1	20.4 (13.0 – 29.8)	18.6 (16.5 – 20.9)	12.7 (5.3 – 24.6)	9.4 (6.8 – 12.7)	14.3 (9.4 – 20.6)
1 to < 2	57.9 (47.4 – 67.9)	54.8 (52.0 – 57.5)	48.9 (34.9 – 63.0)	40.1 (35.3 – 45.1)	35.2 (28.0 – 43.1)
≥ 2	21.5 (13.9 – 31.0)	26.4 (24.1 – 28.9)	38.2 (25.2 – 52.7)	50.3 (45.3 – 55.4)	50.3 (42.4 – 58.2)
Family history of myocardial infarction, diabetes and/or hypertension					
N	65	1003	40	275	107
Yes	52.3 (40.2 – 64.2)	34.2 (31.4 – 37.2)	45.0 (30.2 – 60.5)	42.5 (36.7 – 48.4)	47.6 (38.3 – 57.1)
Practice of sports and/or competition					
N	83	1225	46	375	156
No	25.3 (16.8 – 35,4)	22.7 (20.4 – 25.1)	15.2 (6.9 – 27.8)	26.6 (22.3 – 31.3)	26.2 (19.8 – 33.6)
Hours spent watching TV, playing video game or using the computer					
N	88	1276	50	380	151
More than 2	64.7 (54.3 – 74.2)	68.4 (65.8 – 70.9)	56.0 (42.0 – 69.2)	70.5 (65.7 – 74.9)	68.2 (60.4 – 75.2)
Consumption of fruits and vegetables					
N	90	1299	50	400	152
< 6 servings	77.7 (68.3 – 85.4)	83.9 (81.8 – 85.8)	86.0 (74.2 – 93.6)	79.2 (75.0 – 83.0)	82.8 (76.2 – 88.2)
Salt consumption					
N	75	1023	44	338	128
Score ≥ 5	45.3 (34.3 – 56.6)	39.9 (37.0 – 43.0)	40.9 (27.1 – 55.7)	35.2 (30.2 – 40.4)	36.7 (28.7 – 45.3)
Consumption of soft drinks					
N	86	1271	50	395	156
Yes	74.4 (64.4 – 82,7)	65.2 (62.5 – 67.8)	70.0 (56.3 – 81.4)	68.6 (63.9 – 73.0)	64.1 (56.3 – 71.3)
Body mass index					
N	83	1213	48	369	148
≥ 85 percentile	19.2 (11.8 – 28.8)	24.6 (22.2 – 27.1)	41.6 (28.4 – 55.9)	22.2 (18.2 – 26.6)	25 (18.5 – 32.4)

adolescents consume fruits and vegetables in quantities greater than or equal to five times per day[26], and the prevalence of soft drink consumption among children and adolescents aged 6 to 17 increase from 37% to 56% in a 20-year period[27]. It is possible that situations arising out of family and friends dynamics, increasing supply of processed food, affordable prices and marketing appeal (through multiple strategies) are important determinants of this eating behavior.

Epidemiological studies that examine the prevalence of physical inactivity in children and adolescents reveal a wide variability among their findings, which can be attributed to the instruments used, which have their own limitations[28], and the different ways of categorizing this variable in addition to sampling differences. The practice of sports or competitions represents the time spent with physical activities out of home and school environments (leisure activities) and is highly predictive of physical activity in children[29]. In this work, the absence of this practice varied from 14.4% to 32.1%. Brazilian studies of databases reveal prevalence of sedentary lifestyle in adolescents aged 10 to 12 - 49% among boys and 67% among girls[30]; in adolescents aged between 15 and 18 - from 22.2% to 57.7%[31]; and in adolescents aged 7 to 14 - from 11.6% and 37.8% for school and leisure physical activities, respectively[32]. In the United States, absence of moderate or

vigorous physical activity in youth varies from 4.2% to 23.5%[26]. Another method used to assess a sedentary lifestyle in this study was the time spent watching TV, playing video game or using computers - more than 60% of students remained in this activity for more than two hours. Studies that analyze the daily average time that Brazilian children watch TV reveal values ranging from 3 hours and 31 minutes to 4 hours and 51 minutes - Brazilian children spend more time watching television than living with their family or in the school. It is important to emphasize that, combined with factors related to family and social dynamics, there is a close link between the time a child watches TV and the acquisition of unhealthy habits such as consumption of food with high calorie and salt contents[30,33]. Even without separating the time spent watching TV from the time spent playing video game and using the computer and considering that the TV sets are present in most Brazilian homes[33], the results of this and other studies adress to the relationship between this variable and others related to lifestyle or, otherwise, to the influence of TV on the behaviors or lifestyles, particularly those associated with risk of cardiovascular diseases in children and adolescents. The data of this study are consistent with trends of declining physical activity and increased sedentary behaviors from ages 11 to 12, related to gender, ethnicity and socio-economic levels revealed in a longitudinal study of five years with 5,863 British students[34].

The prevalence of overweight and obesity in this study ranged from 18.7% to 41.6% among subgroups. These levels are above those found in a cross-sectional study conducted in 2001/2002 with 3,169 students aged 7 to 14, which reveals a prevalence of 15.9%[32], but consistent with the work that shows the increasing trends of overweight in the United States, China and Brazil in two consecutive periods. That study, which uses data from representative Brazilian samples and as definition of overweight the reference of the International Obesity Task Force, reveals a prevalence of overweight in Brazil of 13.9% ± 0.66 in general and in 18.4% ± 1.06 in the urban region in 1997, and an annual increase in prevalence for the study period of 0.46% ± 0.03 in general and 0.63% ± 0.05 for the urban area[35].

Conclusion

This study focused on adolescents from grade 5 to 8 of elementary school because adolescence is a stage of development characterized by biological, psychological and social changes. In this phase, adult behaviors and roles, which were imitated at the pre-adolescence phase, are then practiced. It is a time to experiment behaviors, characterized by an increasing autonomy from parents and an increasing reliance on peers, who would otherwise drive and validate new ways of being and appearing. All school grades selected cover a complete cycle of education.

The authors observed a sample of adolescent students from two school districts in the city of São Paulo for the presence of risk factors for cardiovascular diseases in adults. Further studies are required to deepen the understanding of the association relationships between different variables related to risk for cardiovascular diseases, in order to contribute to the proper recommendation of interventions focusing on the prevention of cardiovascular diseases in adults during the adolescence phase.

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Potential Conflict of Interest

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