Original Article

Prevalence of Cardiovascular Risk Factors in Child and Adolescent Students in the City of Maceió

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Objective

To determine the prevalence of systemic arterial hypertension (SAH), "risk of overweight," overweight, sedentary lifestyle, and smoking in children and adolescents from 7 to 17 years of age, of both sexes, in public and private schools in the city of Maceió, in the state of Alagoas.

Methods

A cross-sectional epidemiological study with sampling from a population pool was carried out. It comprised elementary and middle schools, randomly selected. The sample was calculated based on the expected lower prevalence of the variables studied. The assessment protocol comprised a structured questionnaire, anthropometry, and blood pressure measurements. The chi-square test was used to analyze the association among variables.

Results

*In 2001, 1,253 students (547 of the male sex; mean age, 12.4±2.9 years) were assessed. The results were as follows: 1.172 students participated in no moderate to intense physical activity; "risk of overweight" and overweight were present in 116 and 56 individuals, respectively; blood pressure in the ≥ 95th percentile was identified in 97 students; and only 30 students admitted smoking regularly. The following significant associations were observed: "risk of overweight" and overweight in private school students (*P=0.0001) and sedentary lifestyle in the female sex (*P=0.0001).*

Conclusion

The prevalence of a sedentary lifestyle, "risk of overweight," overweight, systemic arterial hypertension, and smoking in the population studied was 93.5%, 9.3%, 4.5%, 7.7%, and 2.4%, respectively.

Key words

cardiovascular risk factor; children and adolescents; prevalence

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Received for publication: 04/06/2004
Accepted for publication: 05/26/2004

In all Brazilian states, considering all age groups, cardiocirculatory diseases have accounted for the greatest number of deaths due to coronary heart disease, cerebrovascular diseases, and heart failure [1], and are currently the major cause of expenses in medical care in the Brazilian Public Health System (Sistema Único de Saúde - SUS) [2].

Approximately 75 to 80% of patients with coronary heart disease (CHD) have conventional or classic risk factors, represented by systemic arterial hypertension, smoking, hypercholesterolemia, diabetes mellitus, advanced age, male sex, familial antecedents, sedentary lifestyle, emotional stress, and obesity [3-6]. Evidence exists that the atherosclerotic process begins during childhood, progresses with age, and has a directly proportional severity to the number of risk factors possessed by the individual [7]. That is why it is believed that the primary prevention of cardiovascular diseases should begin in childhood [8], mainly through education to promote cardiovascular health with emphasis on the importance of diet and maintenance of regular physical activity throughout life [9-11].

The prevalence of cardiovascular risk factors in individuals of any age group in the city of Maceió, in the Brazilian state of Alagoas, is unknown, which hinders the establishment of intervention strategies that can change the current profile of cardiovascular mortality in the medium and long run [1]. This type of action is highly important due to the foretelling of an epidemic of cardiovascular disease in developing countries, such as Brazil, mainly in their poorer regions, such as the state of Alagoas [12-14].

This study aimed at determining the prevalence of cardiovascular risk factors (arterial hypertension, smoking, "risk of overweight," overweight, and sedentary lifestyle) in children and adolescents attending school in the city of Maceió, in the Brazilian state of Alagoas.

Methods

An epidemiological, observational, cross-sectional study was carried out during the 2001 school year in a representative sample comprising children (from 7 to < 10 years) and adolescents (from 10 to 17 years) of both sexes registered in the elementary and middle levels of public (municipal, state, and federal) and private schools in the city of Maceió. The age limits were established as 7 and 17 years, considering that, by the age of 18 years, some adolescents have already completed the middle level study. The number of schools and students per institution was obtained in the school census provided by the Secretariat of Education of the State of Alagoas, which had a total number of 185,702 registrations [15].

Calculation of the sample considered the lower prevalence expected in the variables chosen for the study (7% for arterial hypertension), 95% confidence level, and 2% accuracy. The final sample should comprise 623 students, representing a universe of 185,702 registered students [15]. We chose to double the sample to increase the accuracy of the research. Sampling from a population pool was performed, each school being considered a population pool. Forty of the 396 schools registered in the Secretariat of Education of the State of Alagoas were randomly selected, aiming at obtaining the greater accuracy in the estimates of prevalence. The schools have different numbers of students; therefore, to obtain a representation in the final sample that is proportional to the size of each school, 2.7% of all students registered in each school were randomly selected.

For the draw of the schools, all 396 schools were sequentially listed with their respective number of students, and, beside the attendance column, an accumulated attendance column was created. The total number of students was divided by 40 (for the 40 schools randomly selected), and the sample interval of 4,642.55 was obtained. Using the table of casual numbers, a number between one and the value of the sampling interval was randomly selected. The randomly selected number, 531, was found in school # 1, which had 767 students, and that school was, then, randomly selected. Adding successively the sampling interval to the values found, the 40 schools were randomly selected. The sample obtained comprised one federal school, 20 state schools, 8 municipal schools, and 11 private schools, representing, respectively, the registered schools: one federal, 124 state, 69 municipal, and 202 private.

At each school, the students were randomly selected based on the sampling interval value (total number of students divided by the number of students to be randomly selected), and then a number between one and the sampling interval was randomly selected, constituting the first student. Then the value of the sampling interval was successively added to the previously obtained number, identifying the students comprising the sample at each school. The draw was performed after obtaining the lists of students comprising the different classes of the school in question, which, sequentially arranged and having the students enumerated from the first (first student in the first class) to the last (last student in the last class), provided the identification of the students randomly selected.

The headmasters of the randomly chosen schools were invited to meet the primary investigators of the project to learn about the importance of the study, its objectives, and methodology. After obtaining the consent of the headmasters (100% of the schools chosen), the research team had access to the attendance lists of students, who were then randomly selected according to the already described procedure. The randomly selected students and their parents were informed about the project and invited to sign a written informed consent (the parents, in the case of students below the age of 16, and the students themselves, when they were older than 16 years). When a student refused to participate, or when the student randomly selected was older than 17 years, another student at the same school was randomly selected according to the already described methodology.

Data were collected in personal and individual interviews with one or both of the parents and added to data from the student, obtained individually, with a questionnaire (identification and socioeconomic data of the parents and student, parents' cardiovascular risk factors, smoking practices, and physical activity of the student). After the interview, the students underwent anthropometric assessment and blood pressure measurement.

In this study, the variables studied were as follows: systemic arterial hypertension, "risk of overweight," overweight, sedentary lifestyle, and smoking practices. The distributions of those variables were analyzed according to sex, type of school (public or private), and socioeconomic class.

For economic classification, the Brazilian Criterion of Economic Classification (Critério de Classificação Econômica Brasil - CCEB)[16] was used. It allows the stratification of the population into 5 economic classes (from A to E), based on the responses of the interviewees in regard to standard of living, daily presence of a maid at the student's house, and educational level of the head of the household. The classification in points allows an inference about the mean familial income: class A – R$ 6,220.50; class B – R$ 2,236.50; class C – R$ 927.00; class D – R$ 424.00; and class E – R$ 207.00.

Systemic arterial hypertension was considered the mean (of 2 measurements) of systolic or diastolic blood pressure, or both, in the ≥ 95th percentile for age and sex adjusted for the percentile of height [17,18]. A Tycos mercury column manometer with cuffs of 3 different dimensions (adult, adolescent, child) and a pediatric Littman stethoscope were used. All measurements were performed by the same physician after receiving specific training. The methodological recommendations of the III Brazilian Consensus on Arterial Hypertension (III Consenso Brasileiro de Hipertensão Arterial) and of the Update on the 1987 Task Force Report on High Blood Pressure in Children and Adolescents, summarized by Koch, were used [19].

The "risk of overweight" was defined as body mass index (BMI) in the ≥ 85th percentile, identified in a population-specific table as a function of age [20,21]. The BMI in the ≥ 95th percentile, in the same table, was used to define overweight [20,21]. Weight was measured with a Filizola digital scale, with an accuracy of 100 g. Height was measured with a stadiometer with a cursor, both made of wood, with a 0.1-cm accuracy. The anthropometric measurements were taken by a single researcher according to the norms standardized by WHO [22]. Weight and height data (mean of 2 measurements) were used to calculate BMI.

The sedentary lifestyle was analyzed based on the investigation of the students' physical activity by using the Physical Activity Questionnaire (PAQ) already validated for the age group being investigated [23,24] and adapted to exclude physical activities not practiced in Brazil [25]. The PAQ investigates moderate and intense physical activities in the 7 days preceding the completion of the questionnaire (therefore, including the weekend). The questionnaire comprises 9 questions about participation in sports and games, physical activities at school and leisure time; the value of each question ranges from 1 to 5, and the final score is the mean of the questions. At the end, the score obtained establishes an interval ranging from very sedentary to very active (from 1 to 5): 1 – very sedentary; 2 – sedentary; 3 – moderately active; 4 – active; and 5 – very active.

Smoking practices were analyzed when the participant had a current habit of tobacco use regardless of the daily amount and the duration of the habit. Smoking practices were inquired about

during the individual interview with each student, who was informed about the commitment of the research team to maintain secrecy about the responses obtained.

Considering the multiplicity of the variables investigated, the wide universe of schools and students, the complexity of the investigation tool, and the multidisciplinarity of the team, a pilot study was carried out in the year 2000, aiming at assessing the feasibility of the project, by demonstrating its difficulties and the ways to solve them or minimize them, at promoting training of the team, and reducing the possibility of bias in data collection [26].

For studying the prevalence of the variables, the frequencies were used after identification of the cut-off points for the continuous variables and the presence/absence of discreet variables. The chi-square test was used for the association tables to compare the groups in regard to sex, type of school (public or private), and economic class. The value of 0.05 or 5% was established as the level of rejection of the null hypothesis, and the significant values were marked with an asterisk.

The research project was approved by the committee on ethics of the university-affiliated hospital of the Universidade Federal de Alagoas.

Results

This study assessed 1,253 students (7 more than the number predicted because of small variations in registration at some schools), 547 (43.7%) were of the male sex, 706 (56.3%) were of the female sex, and their mean age was 12.4±2.9 years. The demographic characteristics of the population studied are shown in table I.

Throughout the selection process, 4 students, or their parents, refused to participate in the study (0.3%), and 198 (15.8%) were older than 18 years or younger than 7 years, which required a new random selection according to the established procedure.

Regarding the students, 267 (21.3%) were from private schools, and 986 (78.7%) were from public schools (state schools, 741 students; municipal schools, 193; and federal schools, 52).

In regard to economic classification, 70 (5.6%) students belonged to class A, 155 (12.3%) belonged to class B, 341 (27.1%) to class C, 567 (45.2%) to class D, and 120 (9.8%) to class E. For assessing the association of variables, the association of classes was considered (classes A+B and classes C+D+E), and 72.3% of the students who belonged to classes A and B attended private schools, while 89.8% of those belonging to classes C, D, and E studied in public schools. A significant association was observed between classes A and B and private school (*P < 0.0001).

The prevalence of the variables studied and their distribution according to sex, type of school, and economic class are found in tables II and III, respectively.

Ninety-seven students were identified with systolic or diastolic (mean of 2 measurements) blood pressure, or both, in the ≥ 95th percentile, identifying a prevalence of systemic arterial hypertension of 7.7% (CI=6.5 – 9.5) in the population studied. No association of the frequency of hypertension was found with sex (P=0.33) and the type of school (public or private) (P=0.19). A significant association was found with economic class A+B (*P=0.02).

The "risk of overweight" was identified in 116 students, determining a prevalence of 9.3% in the population studied (CI= 7.8 – 11.2). The frequency of that variable was equal in both sexes (P=0.28), but significantly predominated among students from private schools (*P=0.0001) and from the social classes A+B (*P < 0.0001). Overweight was identified in 56 students, resulting in a prevalence of 4.5% (CI=3.4 – 5.6). A significant association of overweight was observed with private school students (*P=0.0002).

The smoking habit was reported by only 30 students, which resulted in a low prevalence of 2.4% of that risk factor (CI=1.6 – 3.2). Several students, however, reported that they had already smoked cigarettes. No association was observed between smoking habit and sex (P=0.35), type of school (P=0.82), and economic class (P=0.09).

The analysis of the responses to the physical activity questions (PAQ) identified 1,172 students as sedentary (sum of sedentary and very sedentary); therefore, that variable was present in 93.5% (CI=92.2 – 94.8) of the sample. A significant association of sedentary lifestyle and the female sex was observed (*P < 0.0001), but its frequency did not differ between public and private schools (P=0.78), not even in the grouped economic classes (P=0.45).

Discussion

Worldwide investigations have shown the importance of researching risk factors for coronary heart disease in children and adolescents [27-36], considering that that is the period in which the

Table I - Demographic characteristics

Characteristics	Nº
Age (years)	12.4 ± 2.92
Gender	
Male	547 (43.7%)
Female	706 (56.3%)
Age groups	
Children	249 (19.9%)
Adolescents	1,004 (80.1%)
School	
Public	986 (78.7%)
Private	267 (21.3%)
Socioeconomic class	
A	70 (5.6%)
B	155 (12.3%)
C	341 (27.1%)
D	567 (45.2)
E	120 (9.8%)

Table II - Prevalence of the variables studied

Variables	n	%
Nutritional status		
Low weight	83	6.6
Normal weight	998	79.6
Risk of overweight	116	9.3
Overweight	56	4.5
Blood pressure		
Normal	1,156	92.3
High	97	7.7
Smoking habit		
Present	30	2.4
Absent	1,223	97.6
Physical activity		
Active	81	6.5
Sedentary	1,172	93.5

Table III - Distribution of the variables studied according to sex, type of school, and economic class

		Sex		Type of school		Economic class	
	N (1,253)	M (547)	F (706)	Public (986)	Private (267)	A+B (225)	C+D+E (1,028)
High BP	97	47	50	71	26	26 *	71
Risk of overweight	116	54	62	74	42**	41**	75
Overweight	56	26	30	33	23**	13	43
Smoking	30	14	16	23	7	9	21
Sedentary lifestyle	1,172	494	678**	921	251	208	964

*P<0.05; **P<0.01.

patterns of diet and lifestyle are established, with serious implications for the risk of developing the disease in adulthood [37,38]. It has been shown that intervention, even in this phase, on the risk factors detected, mainly through the involvement of children and adolescents in the educational strategies adopted, results in beneficial changes in the risk profile identified [39-42]. The risk factors identified in children and adolescents tend to persist throughout adult life [43-47], contributing to the establishment of coronary heart disease in increasingly younger age groups.

The state of Alagoas has a profile of morbidity and mortality in which cardiovascular diseases coexist (as the most frequent cause of death) with one of the greatest rates of infantile mortality in the country (82.8 per 1,000 live births), highlighting the urgent need for economic strategies that can minimize the dramatic social differences and health care strategies that can eradicate malnutrition and infantile mortality. Studies similar to ours could help in the planning of primary prevention actions regarding cardiovascular diseases.

The prevalence of primary systemic arterial hypertension in children and adolescents has ranged from 0.5 to 15% in several studies depending on the methodology used for blood pressure measurement, the parameter used for defining diastolic blood pressure, the age group investigated, and the number of blood pressure measurements taken [27-36,48,49]. The III Brazilian Consensus on Arterial Hypertension (III Consenso Brasileiro de Hipertensão Arterial - III CBHA)[17] established that, in Brazil, the prevalence of systemic arterial hypertension in children and adolescents ranges from 6 to 8%. Analyzing the prevalence of that variable in children and adolescents aged 6 to 18 years in the city of Belo Horizonte, Oliveira et al [48] reported a 3.9% prevalence of students with blood pressure in the ≥ 95th percentile. The present study, using a protocol similar to that of Oliveira et al [48], found a 7.7% prevalence of hypertension; this difference can be partially explained by the fact that the age group studied by those authors included younger children, which may have contributed to reducing the prevalence of hypertension.

Contrary to that which occurs in adults, no consensus exists about the anthropometric criteria most appropriate for classifying overweight and obesity in childhood and adolescence [50]. Growth charts, reference curves of BMI for age, percentage BMI, lean body mass index, and skinfold measures have been used for that purpose[50,51], which hinders the comparison of results. In our study, we chose to use the population-specific BMI reference curve for age from the National Health and Nutrition Examination Survey I (NHANES I) [20,21], also used by the World Health Organization [22]. The results showed a 9.3% frequency of children and adolescents with BMI in the ≥ 85th and < 95th percentiles, and a 4.5% frequency of BMI in the ≥ 95th percentile, establishing that 13.8% of the 7- to 17-year-old students in the city of Maceió have some degree of overweight. Using the same criteria, Albano and Souza [52] identified that, in 11- to 17-year-old students in public schools in São Paulo, 19.1% of the individuals were at "risk for overweight" and 10.5% were overweight, which resulted in 29.6% of individuals with excessive weight. Using the same criteria, Balaban and Silva[53] identified, in 762 children and adolescents from a private school in the city of Recife (with an economic profile similar to that of the city of Maceió), a 34.3% prevalence of overweight, much higher than that observed in our study, even when considering only the set of private schools (65/267 students with BMI in the ≥ 85th percentile, corresponding to 24.3%). These data show that currently in the city of Maceió, the prevalence of excessive weight in children and adolescents may be considered lower than that observed in some specific groups, in addition to providing information on the importance of current preventive actions and a parameter for future population analyses.

The practice of smoking among students in the elementary and middle educational levels in Brazil has ranged from 1 to 34%[54-57]. In 1989, a study performed in 10 Brazilian capitals reported that 20% of the students in those levels used tobacco [57]; that, therefore, was the expected prevalence in the present study, which, however, identified the presence of that variable in only 2.4% of the interviewees. The possibility that some interviewees might have omitted their involvement with tobacco use should not be ruled out, which may have contributed to a lower prevalence than the real one. However, one may suppose that the antitobacco campaigns promoted in recent years may have actually caused a significant reduction in the number of individuals who start the habit during childhood or adolescence.

Regular participation in physical activity has been recommended not only for prevention of and rehabilitation from cardiovascular diseases, but also as an important strategy for health promotion[58,59]. Despite this, the studies in Brazil have indicated a frequency of sedentary lifestyle among adults ranging from 55.8 to 80.8%[60-63]. The studies in children and adolescents using different parameters have reported a prevalence of sedentary lifestyle of up to 89.5%[23,64-66]. In a study carried out with 14-to 15-year-old students of both sexes from the public school system in the city of Niterói, using the PAQ-C [21-23], Silva and Malina [25] identified an 89.5% prevalence of sedentary individuals. In our study, which comprised 7- to 17-year-old individuals and used the same instru-

ment to investigate physical activity, 93.5% of the students were considered sedentary, a result not very different from that reported by Silva and Malina [25]. Because the study in the city of Maceió included younger individuals, a lower prevalence of that variable was expected, considering that the greater decrease in physical activity occurs during adolescence[67], and that the participation in physical activity decreases with age for all types of exercise [67].

This study aimed at establishing the prevalence of systemic arterial hypertension, "risk of overweight," overweight, sedentary lifestyle, and smoking in children and adolescents in the city of Maceió by using current parameters for defining the variables in question, so that the study could be reproduced in other cities in the state of Alagoas and in other states. In this way, a profile (state or national, or both) could be developed in regard to the variables considered. The data obtained in our study reinforce the need for obtaining individualized information in different Brazilian cities, due to the great Brazilian heterogeneity in the most diverse aspects (economic, geographic, ethnic, behavioral, and others), which result in undeniable differences in the health profile of the population groups.

The study results allow adoption of educational and health strategies in the city of Maceió, which encourage youth to discuss questions about health promotion and prevention of future diseases that result from risk factors present since childhood, as well as the adoption of health measures that urgently interfere with the profile identified. The risk profile shown here is motivation for the state to take action to develop physical activity and weight control programs for children and adolescents, considering that those are currently the most prevalent variables.

Acknowledgments

We thank the Fundação de Amparo à Pesquisa in the state of Alagoas (FAPEAL) and the Programa Institucional de Bolsas de Iniciação Científica-CNPq/Universidade Federal de Alagoas (PIBIC/CNPq/UFAL) for the financial support received.

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