

## CARDIOVASCULAR DISEASES: RISK FACTORS IN ADOLESCENTS

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**ABSTRACT:** The objective of this study was to investigate risk factors for cardiovascular diseases in adolescents in the city of Picos, in the state of Piauí, Brazil. A descriptive and cross-sectional study was conducted with 151 adolescents. Data were collected from August to October of 2013 in private schools. The results showed that there are variations in blood pressure of 8.6% and 14.8% in men and women, respectively, with values from 90% to 95%, classifying as bordering high. The majority of the sample presented overweight. The lipid profile of the majority of the population studied was altered. Based on these facts, the development of prevention strategies for adolescents is necessary, aiming to promote healthy lifestyles, such as low-calorie diets and increase of physical activity.

**DESCRIPTORS:** Cardiovascular diseases; Risk factors; Adolescents; Prevalence.

### DOENÇAS CARDIOVASCULARES: FATORES DE RISCO EM ADOLESCENTES

**RESUMO:** O objetivo do estudo foi investigar os fatores de risco para doenças cardiovasculares em adolescentes do município de Picos-Piauí. Estudo descritivo e transversal realizado com 151 adolescentes. A coleta de dados ocorreu no período de agosto a outubro de 2013 nas escolas particulares. Os resultados evidenciaram que há presença de alterações na pressão arterial nos indivíduos do sexo masculino e feminino, 8,6% e 14,8%, respectivamente, com os valores entre os percentis 90 e 95, classificando como limítrofe. A maioria da amostra apresentou excesso de peso. O perfil lipídico estava alterado em boa parte da população estudada. Com base nesses achados, torna-se necessário a formulação de estratégias de prevenção para os adolescentes visando à promoção de estilos de vida saudáveis como dietas com baixa densidade energética e incremento na atividade física.

**DESCRIPTORIOS:** Doenças cardiovasculares; Fatores de risco; Adolescentes; Prevalência.

### ENFERMEDADES CARDIOVASCULARES: FACTORES DE RIESGO EN ADOLESCENTES

**RESUMEN:** El objetivo de este estudio fue investigar los factores de riesgo a las enfermedades cardiovasculares en adolescentes del municipio de Picos-Piauí. Estudio descriptivo y transversal, realizado con 151 adolescentes. Datos recolectados durante el período de agosto a octubre de 2013 en las escuelas particulares. Los resultados evidenciaron que existe presencia de alteraciones en la presión arterial de los individuos de sexo masculino y femenino, 8,6% y 14,8% respectivamente, con los valores entre los percentiles 90 y 95 clasificando como limítrofes. La mayoría de la muestra presentó exceso de peso. El perfil lipídico estaba alterado en buena parte de la población estudiada. En base a tales hallazgos, resulta necesaria la formulación de estrategias de prevención para los adolescentes, apuntando a la promoción de estilos de vida saludables, incluyendo dietas de baja densidad energética e incremento de la actividad física.

**DESCRIPTORIOS:** Enfermedades Cardiovasculares; Factores de Riesgo; Adolescente; Prevalencia.

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## ● INTRODUCTION

In the last century, the accelerated growth of the urbanization process, associated with industrialization and technological development, led to changes in the population's lifestyle of several countries, such as the adoption of inappropriate eating habits and physical inactivity. This context contributed for a change in the main causes of mortality and morbidity, with prevalence of chronic noncommunicable diseases (NCDs) compared to infectious diseases.

These diseases are a global health issue and a threat to health and human development. They are a burden for low- and middle-income countries<sup>(1)</sup>.

In Brazil, NCDs and external causes were the main causes of death in 2009, corresponding to 85.0% of the total of deaths. Among deaths by NCDs, the main causes are cardiovascular diseases (CVDs), especially ischemic heart diseases, hypertensive diseases and cerebrovascular diseases. According to the Strategic Action Plan to Combat Chronic Noncommunicable Diseases (NCD) in Brazil, 31.3% of the population died because of these diseases in 2008<sup>(2-3)</sup>.

The impact of NCDs will be higher in developing countries like Brazil, since they contribute more for their onus, comparing to developed countries. It is predicted that death risk might increase 20% until 2010 in developed countries, and the percentage might double in developing countries. According to data from Columbia University and the World Bank, if the current projections are maintained, Brazil will have the world's highest rates of new cases in the next decades<sup>(4)</sup>.

Noncommunicable diseases have a multifactorial origin, in which risk factors participate in their genesis. Risk factors are variables that predispose the appearance and development of, in this case, heart diseases, thus, their monitoring helps identify early signs that if modified, might decrease or even reverse the disorders' evolutionary process<sup>(5)</sup>.

These risk factors can be classified as modifiable, such as smoking, high serum cholesterol, systemic arterial hypertension, physical inactivity, diabetes, obesity, stress, use of contraceptive pills and abdominal obesity; and as non-modifiable, such as heredity, gender and advanced age<sup>(4)</sup>.

Such risk factors present in adolescents are related to behavioral factors like alterations of physical activity habits, resulting in increased inactivity rates, as well as changes in eating habits, especially with the increase in consumption of lipids. Adolescents are exposed to the abovementioned risk factors, especially regarding nutritional problems, such as overweight and development of early childhood obesity<sup>(6-7)</sup>.

Adolescence is characterized as a favorable period for the development of interventionist strategies to combat NCDs, once there is evidence that these diseases might originate from this life period. Furthermore, several risk factors of biological origin acquired in adolescence tend to last until the age of majority, increasing the risk of morbidity and mortality in adult life.

Therefore, the early identification of cardiovascular risk factors is of utmost importance for developing health promotion actions and monitoring Brazilian adolescents. The results of this study will contribute significantly for a higher knowledge of the epidemiological situation in this age group and for decision making, both for the health and the education area.

Nursing, as a health profession, should also focus on the emergency of risk factors in younger ages, acting to prevent their development by contributing for a decrease of morbidity and mortality caused by NCDs.

In this perspective, this study investigated risk factors for cardiovascular diseases in adolescents of private schools in the city of Picos, in the state of Piauí.

## ● METHODS

This descriptive cross-sectional study was conducted from May to November of 2013, in private elementary and high schools in the city of Picos, in the state of Piauí, Brazil. Only eight private schools that accepted to grant an institutional authorization participated in the study. Public schools were object of a previous study.

The population comprised all adolescents from 10 to 19 years old who were regularly enrolled in private schools of the urban area. For the calculation of the sample size, the following formula for cross-sectional studies with finite populations was used<sup>(8)</sup>:  $n = (Z\alpha^2 * P * Q * N) / (Z\alpha^2 * P * Q) + (N - 1) * E^2$ , where:  $n$  = sample size;  $Z\alpha$  = confidence coefficient;  $N$  = population size;  $E$  = absolute sampling error;  $Q$  = complementary percentage (100-P);  $P$  = proportion of occurrence of the phenomenon studied.

A confidence coefficient of 95% (1.96), sampling error of 3% and population of 2,250 adolescents (10 to 19 years) ( $N = 2,250$ ) were considered as parameters. The prevalence considered was the lowest expected among the chosen variables for study (7% for arterial hypertension) ( $P = 0.07$ )<sup>(9)</sup>. The formula application resulted in a total of 151 participants.

The participants were proportionally selected according to the number of students enrolled in each school. The inclusion criteria were defined as follows: adolescents from 10 to 19 years old, whose parents agree to participate in the study and to sign a free and informed consent form. The exclusion criterion was adolescents with adoptive parents, which makes data collection difficult in relation to family background for NCDs. The sample of all adolescents that met the eligibility criteria in education institutions was randomly selected.

Data were collected from August to October of 2013 by Nursing and Nutrition undergraduate students who had been trained with standard techniques. A form (containing information about the identification of adolescents, anthropometry, hemodynamic measurements, eating habits and physical activity) and a questionnaire (containing information about health of biological parents and eating habits) adapted from another study were used<sup>(10)</sup>.

Blood pressure (BP) was measured by the traditional auscultatory method, using an aneroid sphygmomanometer placed near the heart and a stethoscope placed above the brachial artery. Systolic blood pressure was defined as the sounds of Korotkoff phase 1 (K1) and diastolic as the Korotkoff phase 5 (K5) or the disappearance of sounds<sup>(6)</sup>.

This verification followed the procedures recommended in the VI Brazilian Guidelines on Hypertension (2010). Cuffs with appropriate size for the arm circumference of children and adolescents were used. Curves for the determination of the adolescents' height percentile according to age and gender were used for the classification of BP, according to the National High Blood Pressure Education Program of the United States (NHBPEP, 2004) and the BP percentile table referenced by the V Brazilian Guidelines on Hypertension (2006)<sup>(11-13)</sup>.

After a 12-hour fasting, venous blood collection was performed in the premises of the studied schools for further biochemical analysis. The samples were collected in non-anticoagulation gel separator vacuum tubes. After collection procedures, the blood was centrifuged for 10 minutes at 3,000 rpm to separate the serum from the other components, and the serum was used for analyses. Triglycerides and blood glucose were dosed using a colorimetric enzymatic kit processed in the Autohumalyzer A5 (Human-2004).

The exam was carried out according to the determinations of the I Guideline for Preventing Atherosclerosis in Childhood and Adolescence. The values of reference used were as follows: total cholesterol: <150 mg/dL desirable, 150-169 mg/dL bordering high and > 170 high. LDL-C: <100 mg/dL desirable, 100-129 mg/dL bordering high and > 130 mg/dL high. HDL-C: >45 mg/dL desirable. Triglycerides: <100 mg/dL desirable, 100-129 mg/dL bordering high and > 130 mg/dL high. For blood glucose: <100 mg/dL normal, 100-125 mg/dL impaired glucose tolerance, > 126 mg/dL diabetes mellitus<sup>(14-15)</sup>. These blood tests were financed by the researchers.

Data were analyzed based on literature reviews and statistical treatment, and presented by tables. First, a database was set up in a Microsoft Office Excel 2010 spreadsheet and subsequently transported to SPSS 20 software. Descriptive statistics was used for analysis.

The development of this study complied with all ethical principles contained in Resolution 466/12 of the National Health Council, for research involving human subjects<sup>(16)</sup>. The project was properly approved by the Research Ethics Committee of the Federal University of Piauí, under protocol no. 352,372. All participants who agreed to participate in the study signed a free and informed consent form and the informed assent form for adolescents under 18 years old.

## ● RESULTS

The collected data were organized according to groups of answers, presented by tables and analyzed with descriptive statistics.

Table 1 shows a prevalence of female adolescents (53.6%), being the majority of brown color (44.4%). The prevalent age group was from 10 to 14 years (72.84%), with median age of 13 years.

Data observed in Table 2 showed that 64.3% and 50.6% of male and female adolescents, respectively, presented excess weight (obesity and overweight).

Alterations were found in blood pressure levels in both genders. Considering hypertension stage I and II, 15.7% of male adolescents and 14.8% of female adolescents showed high BP, according to Table 3.

Regarding the characterization of lipid and glucose profile, it is worth mentioning the percentage of the alterations found, since adolescence is a healthy period, in which significant alterations are not expected. According to Table 4, the higher markers were total cholesterol (57.1%), LDL-cholesterol (35%) and HDL-low cholesterol (32.9%).

Table 1. Distribution of the sample according to the adolescents' identification data n = 151. Picos, Piauí, Brazil 2013

Variables	F	%	Median (IQ)
Gender			
Female	81	53.6	
Male	70	46.4	
Age (in years)			
10 – 14	110	72.84	13 (2)
15 – 19	41	27.16	
Skin color/ethnic group			
White	51	33.8	
Black	24	15.9	
Brown	67	44.4	
Indigenous	2	1.3	
No answer	7	4.6	
Total	151	100	

Table 2. Distribution of adolescents by nutritional classification based on their body mass index (BMI), n = 151. Picos, Piauí, Brazil 2013

BMI	Male adolescents		Female adolescents	
	F	%	F	%
Severely underweight	1	1.4	-	-
Underweight	1	1.4	1	1.2
Eutrophic	23	32.9	39	48.1
Overweight	26	37.1	27	33.3
Obesity	19	27.2	14	17.3
Total	70	100	81	100

Table 3. Distribution of adolescents according to the classification of blood pressure n = 151. Picos, Piauí, Brazil 2013

BP Classification	Male adolescents		Female adolescents	
	F	%	F	%
Normal	46	65.7	57	70.4
Bordering high	13	18.6	12	14.8
Hypertension stage I	7	10.0	8	9.9
Hypertension stage II	4	5.7	4	4.9
Total	70	100	81	100

According to Table 5, regarding the family background for cardiovascular diseases, considering the fathers, 13.9% had hypertension, 7.3% had diabetes and 2% had heart diseases. In contrast, among the mothers, 15.9% had hypertension and 1.3% had heart diseases. Although these prevalent values were low, it is noteworthy that they are still young adults, since the mean age of mothers was of 39.6 years (data not shown in the table), and 1.3% of them already present heart diseases.

Table 4. Characterization of the lipid and glucose profile of the sample, n = 140. Picos, Piauí, Brazil 2013

Biochemical exams	F	%
<b>Triglycerides</b>		
Desirable	98	70
Bordering high	28	20
Increased	14	10
<b>Blood glucose</b>		
Normal	136	97.1
Impaired glucose tolerance	4	2.9
<b>Total cholesterol</b>		
Desirable	34	24.3
Bordering high	26	18.6
Increased	80	57.1
<b>LDL-C</b>		
Desirable	49	35
Bordering high	42	30
Increased	49	35
<b>HDL-C</b>		
Desirable	94	67.1
Low	46	32.9

Table 5. Distribution of the sample according to family background for cardiovascular diseases, n = 151. Picos, Piauí, Brazil 2013

Family relationship	Mother		Father	
	F	%	F	%
<b>Diseases</b>				
Diabetes	-	-	11	7.3
Hypertension	24	15.9	21	13.9
Heart disease	2	1.3	3	2

## ● DISCUSSION

A group of 151 adolescents from private schools was evaluated to investigate the presence of cardiovascular risk factors in these individuals, since there is a strong correlation between the existence and severity of a NCD, and the presence of risk factors in early stages of life. This increases the concern in detecting these factors precociously, to prevent future complications.

When analyzing the results, 72.84% of the adolescents were aged from 10 and 14 years. The sample was especially made up of female adolescents (53.6%), and a similar fact was observed in a study conducted in the city of João Pessoa, in the state of Paraíba, where 54.9% of the sample were female, similarly to other studies<sup>(17-20)</sup>. The most prevalent skin color was brown, with 44.4%, since Brazil has a mix of races.

When characterizing the adolescents by means of their BMI, there was a prevalence of overweight and obesity of 37.1% and 27.2%, respectively, among males and 33.3% and 17.5% of overweight and obesity, respectively, among females.

The number of overweight adolescents was significant in this study. In contrast, another study, which was also conducted with students, found a prevalence of 16.7% and 11.1% of overweight and obesity, respectively, among males, and 7.6% and 5.3% of overweight and obesity, respectively, among females<sup>(21)</sup>.

The association of BMI in childhood and the risks of coronary events in adult life shows that each increased unit in BMI rises the probability of future occurrence of coronary events, and this correlation

increases with age<sup>(3)</sup>.

In this study, the presence of alterations in the blood pressure of male and female individuals was verified, in which 18.6% and 14.8%, respectively, presented values between 90% and 95%, classified as bordering high (prehypertension). In addition, 15.7% of the male adolescents and 14.8% of the female adolescents presented high BP.

In another study also conducted in the city of Picos with students of public institutions, the percentage of adolescents with bordering high BP was 38.6%<sup>(7)</sup>.

Hypertension is considered an important chronic disease among the adult and elderly population. However, its prevalence has increased in the children and adolescent age group over the last 30 years around the world. A Brazilian publication shows prevalence of high BP in children and adolescents, which ranges between 1% to 12% and 2% to 10%, respectively<sup>(17)</sup>.

Although altered blood pressure levels do not necessarily determine a systemic arterial hypertension (SAH) diagnosis, the fact might point to a risk for developing cardiovascular problem in the adult stage. For a child presenting this problem, for example, the chances to become a hypertensive adult are 2.4 times higher than in other children<sup>(17)</sup>.

The alteration of the lipid and glucose profiles was observed in the majority of the population studied. The parameters evaluated that had an alteration were total cholesterol (75.7%) and LDL-C (65%). A divergent fact was observed in another study, where there were alterations in the TG (50%) and HDL-C (66.6%)<sup>(22)</sup>.

Recent data showed that about 17% of North-Americans present cholesterol levels  $\geq 240$  mg/dL, and point to hypercholesterolemia as the major risk factor for the development of heart diseases<sup>(23)</sup>.

Nonetheless, these results should be carefully interpreted when confronted to prevalence of individuals with undesirable values for the lipid profile from other areas of Brazil, since different criteria used for the classification of dyslipidemia make their comparison difficult<sup>(21)</sup>.

Regarding the family background of diseases, 15.9% of the mothers and 13.9% of the fathers had hypertension. This was also observed in another study, where 10.2% of the mothers and 20.3% of the fathers had hypertension<sup>(24)</sup>.

A study conducted in Finland confirmed the presence of familial aggregation in the pathophysiology of hypertension. Another study verified that when the father or mother had systolic blood pressure above 97%, the systolic blood pressure of their children was increased in 2.7 mmHg at 45 years old; and when both father and mother had increased systolic blood pressure, their children's increase was 8.5 mmHg<sup>(25-26)</sup>.

Despite high investments made to control cardiovascular affections, morbidity and mortality rates have had few changes. Prevention of NCDs must begin in childhood, and healthcare teams must be aware for the identification and early intervention of their risk factors<sup>(23)</sup>.

Such risk factors are mostly related to behavioral factors. Changing this means to make people aware of their health situation and understand the need to change their life habits. It requires professional skills for the inclusion and use of health education methods in their routine when assisting patients, and also more attention of local managers regarding the reorganization of services and prioritization of actions developed in healthcare units<sup>(27)</sup>.

As soon as risk factors for NCDs of a specific population are known, the community, health services and schools of the area will have more control over the required decisions and changes to minimize risks and avoid the advance of diseases and grievances, acting in an integrated and participatory way.

## ● CONCLUSION

According to the results revealed in the present study, the main risk factors for NSD were: overweight, altered blood pressure, total cholesterol, high LDL-C and low HDL-C. Information of this nature are

tools of unquestionable importance for health action.

Adolescence is an important period due to the fast physical and psychosocial changes taking place in this stage, which facilitate the development of risk factors. In addition, it is a period of life especially relevant for the acquisition of behaviors, many of which remain unchanged throughout life.

Based on these facts, it becomes mandatory the development of prevention strategies for adolescents, aiming to promote healthy lifestyles, such as low-calorie diets, increase of physical activity and behavior changes regarding body weight control. Such strategies are better grounded when the magnitude of the problem is acknowledged and present greater effectiveness in children and adolescents.

In this perspective, conducting new studies is of utmost importance, for the development of more efficient and safe impact strategies that might promote changes in this unfavorable epidemiological situation, where chronic diseases, especially the ones from the circulatory system, start at a younger age.

## ● REFERENCES

- Schmidt MI, Ducan BB, Silva GA, Menezes AM, Monteiro CA, Barreto SM, et al. Doenças crônicas não transmissíveis no Brasil: carga e desafios atuais. *The Lancet*. 2011. Série Saúde no Brasil; 4.
- Yokota RTC, Iser BPM, Andrade RLM, dos Santos J, Meiners MMMA, de Assis DM, et al. Vigilância de fatores de risco e proteção para doenças e agravos não transmissíveis em município de pequeno porte, Brasil, 2010. *Epidemiol. Serv. Saúde*. 2012; 21(1): 55-68.
- Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde. Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis (DCNT) no Brasil 2011-2022. Brasília: Ministério da Saúde; 2011.
- Correia BR, Cavalcante E, dos Santos E. A prevalência de fatores de risco para doenças cardiovasculares em estudantes universitários. *Rev Bras Clin Med*. 2010; 8: 25-9.
- Canovas CD, Guedes DP. Impacto de diferentes intensidades de caminhada em fatores de risco cardiovasculares em mulheres sedentárias. *SaudPesq*. 2012; 5(1): 217-24.
- Bozza R, de Campos W, Stabelini Neto A, da Silva MP, Ulbrich AZ, Mascarenhas LPG, et al. Associação do gasto energético diário com fatores de risco para doença cardiovascular aterosclerótica em adolescentes. *R. bras. Ci. e Mov*. 2012; 20(4): 69-76.
- Costa JV, da Silva ARV, de Moura IH, de Carvalho RBN, Bernardes LE, de Almeida PC. Análise de fatores de risco para hipertensão arterial em adolescentes escolares. *Rev. Latino-Am. Enfermagem*. 2012; 20(2): 289-95.
- Luiz RR, Magnanini MMF. O tamanho da amostra em investigações epidemiológicas. In: Medronho A, Bloch KV. Organizadores. *Epidemiologia*. São Paulo: Atheneu; 2008. p. 295-307.
- da Silva MAM, Rivera IR, Ferraz MRMT, Pinheiro AJT, Alves SWS, Moura AA, et al. Prevalência de fatores de risco cardiovascular em crianças e adolescentes da rede de ensino da cidade de Maceió. *Arq. Bras. Cardiol*. 2005; 84(5): 387-92.
- Molina MCB, de Faria CP, Montero MP, Cade NV, Mill JG. Fatores de risco cardiovascular em crianças de 7 a 10 anos de área urbana, Vitória, Espírito Santo, Brasil. *Cad. Saúde Pública*. 2010; 26(5): 909-17.
- Sociedade Brasileira de Cardiologia. Sociedade Brasileira de Hipertensão. VI diretrizes brasileiras de hipertensão. *Rev Bras Hipertens*. 2010; 17(1): 11-7.
- National high blood pressure education program working group on high blood pressure in children and adolescents. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. *Pediatrics*. 2004; 114(Suppl 2): 555-76.
- Sociedade Brasileira de Cardiologia. Sociedade Brasileira de Hipertensão. Sociedade Brasileira de Nefrologia. V Diretrizes Brasileiras de Hipertensão. *Arq Bras Cardiol*. 2006;(86):1-48.

14. Sociedade Brasileira de cardiologia. I Diretriz de prevenção da aterosclerose na infância e na adolescência. Arq. Bras de Cardiol. 2005; 85(Suppl 6): 3-36.
15. Sociedade Brasileira de Diabetes. Diretrizes da sociedade brasileira de diabetes: 2012-2013. São Paulo: AC Farmacêutica; 2013.
16. Ministério da Saúde (BR). Conselho Nacional de Saúde. Diretrizes e normas regulamentadoras de pesquisa envolvendo seres humanos. Resolução n. 466, de 12 de dezembro de 2012. Brasília; 2012.
17. da Silva PCV, de Araújo MFM, de Almeida LS, de Vasconcelos HCA, de Freitas RWJF, Damasceno MMC, et al. Pressão arterial de adolescentes de escolas particulares de Fortaleza-CE. Acta Paul Enferm. 2010; 23(4): 512-8.
18. Farias Júnior JC, Mendes JKF, Barbosa DBM, Lopes AS. Fatores de risco cardiovascular em adolescentes: prevalência e associação com fatores sociodemográficos. Rev. bras. epidemiol. 2011; 14(1): 50-62.
19. Beck CC, Lopes AS, Giuliano ICB, Borgatto AF. Fatores de risco cardiovascular em adolescentes de município do Sul do Brasil: prevalência e associações com variáveis sociodemográficas. Rev. bras. epidemiol. 2011; 14(1): 36-49.
20. de Souza MGB, Rivera IR, da Silva MAM, Carvalho ACC. Relação da obesidade com a pressão arterial elevada em crianças e adolescentes. Arq. Bras. Cardiol. 2010; 94(6): 714-9.
21. de Campos W, Stabelini Neto A, Bozza R, Ulbrich AZ, Bertin RL, Mascarenhas LPG. et al. Atividade física, consumo de lipídios e fatores de risco para aterosclerose em adolescentes. Arq. Bras. Cardiol. 2010; 94(5): 601-7.
22. Werner MLF, Pone MV, Fonseca VM, Chaves CR. Lipodystrophy syndrome and cardiovascular risk factors in children and adolescents infected with HIV/AIDS receiving highly active antiretroviral therapy. J Pediatr. 2010; 86(1): 27-32.
23. Ribas SA, da Silva LCS. Dislipidemia em escolares na rede privada de Belém. Arq. Bras. Cardiol. 2009;92(6):446-51.
24. Freitas D, Rodrigues CS, Yagui CM, de Carvalho RST, Marchi-Alves LM. Fatores de risco para hipertensão arterial entre estudantes do ensino médio. Acta paul. enferm. 2012; 25(3): 430-4.
25. Moreira AC. Influências familiares de determinantes precoces na ocorrência da obesidade e no risco cardiovascular em crianças [dissertação]. Viçosa (MG): Universidade Federal de Viçosa; 2010.
26. Carnellosso ML, Barbosa MA, Porto CC, Silva SA, Carvalho MM, Oliveira ALI. Prevalência de fatores de risco para doenças cardiovasculares na região leste de Goiânia (GO). Ciênc. saúde coletiva. 2010; 15(Suppl 1): 1073-80.