ORIGINAL ARTICLE

RELATIONSHIP BETWEEN ANTHROPOMETRIC INDEXES AND BLOOD PRESSURE IN SCHOOLCHIDREN

ABSTRACT

Cardiovascular diseases are major cause of death in the population. To evaluate the anthropometric and blood pressure levels of schoolchildren was aim of the study the aim is checking that the body mass index and waist circumference and relationship with blood pressure. The descriptive study was conducted with 1074 schoolchildren in schools of Crruzeiro do Oestet / PR. The evaluations consisted of: measurement of weight and height to calculate the body mass index, waist circumference and blood pressure. Associations between variables were determined using the chi-square test. We observed high percentage of overweight, CC modified and high pressure measurements. Both BMI and WC showed significant association with the high pressure measurements. There is an association between increased blood pressure and increasing age. Increases in BMI and central adiposity are associated with higher risks of high pressure measurements, and consequently other chronic diseases in 6 to 10 years old children.

KEY WORDS: Body Mass Index, Waist Circumference, Blood Pressure.

RESUMO

As doenças cardiovasculares são a principal causa de morte na população. Avaliar indicadores antropométricos e níveis pressóricos de escolares foi objetivo do estudo, pretendendo verificar o índice de massa corporal a circunferência de cintura e a relação com pressão arterial. Estudo realizado com 1074 escolares, em escolas municipais de Cruzeiro do Oeste/PR. As avaliações consistiram em: medida de peso e estatura para cálculo do índice de massa corporal, circunferência da cintura e pressão arterial. Associações entre as variáveis foram verificadas através do teste de qui-quadrado. Observou-se elevado percentual de excesso de peso, CC alterada e medidas pressóricas elevadas. Tanto IMC como CC demonstraram associação significativa com medidas pressóricas elevadas. Existe associação entre aumento dos níveis pressóricos e aumento da idade. Os aumentos do IMC e adiposidade central estão associados a maiores riscos de medidas pressóricas elevadas e, consequentemente, outras doenças crônicas associadas, em crianças de 6 a 10 anos.

PALAVRAS-CHAVE: Índice de Massa Corporal, Circunferência da Cintura, Pressão Arterial.

INTRODUCTION

Obesity is a major risk factor for developing cardiovascular disease (CVD). However, other factors that influence risk, whether the individual is obese or not, among which stands out as waist circumference (WC), recently identified as a risk factor for CVD not only in adulthood, but also in childhood (SARNI et al., 2006).

The WC reflects the accumulation of abdominal fat or visceral, in turn, is considered one of the most important risk factors for CVD, diabetes, atherosclerosis and hypertension (Sarni et al., 2006; Christófaro et al., 2009). The measurement of DC is one of the most simple, easy and reproducible, used for this purpose (Bergmann et al., 2011).

Hypertension is characterized as a chronic disease, characterized by the persistence of blood pressure values above arbitrarily defined as normal range. It is also the most common risk factor for CVD and is considered a serious public health problem in all socioeconomic extracts and determination of its onset can occur from factors triggered in childhood (MONEJO; GARDEN, 2006).

Obesity can be identified using two methods practical, cost-effective and feasible: WC and BMI. While in adults, abdominal obesity is more often associated with cardiovascular risk than the general obesity, this association in pediatric populations is poorly known. A previous study that examined the association between fat distribution and cardiovascular risk in children indicated that both types of obesity are linked to high pressure measurements in childhood (Christófaro et al., 2009).

Weight control is an important measure for reducing the rates of hypertension and consequently to health promotion and prevention of other cardiovascular diseases (Amer et al., 2011).

Evidence indicates that high pressure measurements in adult life may have its onset in childhood or adolescence have been stressed for decades the association between changes in anthropometric measures and high blood pressure in childhood was more frequent target of concern for child health (KILCOYNE, 1974; ORELLANA, 1985; MONEJO; GARDEN, 2006).

That said, this study aimed to evaluate the anthropometric and blood pressure levels in school and see if the body mass index and waist circumference compared with maintain blood pressure.

METHODS

This is a descriptive study conducted with schoolchidren from 6.0 to 10.9 years, of both sexes enrolled in schools of Cruzeiro do Oeste / PR, a municipality located in the northwest of Paraná state with about 22,000 inhabitants and according to the Atlas of Human Development in Brazil, with the Human Development Index (IDH) of 0.751 and economy based on agriculture (PNUD).

Were measured weight (W) with the aid of a digital scale Tanita (Model 2202) with a capacity of 136 kg and 100 g of resolution, and the height (H) by means of a stadiometer Seca (Bodymeter Model 206) for calculating BMI (body mass index) which was used to define the nutritional status of children as proposed by Cole et al. (2000). WC (waist circumference) was determined by means of an inelastic tape (Sanny) adopting the cutoff points suggested by Fernández et al. (2004) and SBP (systolic blood pressure) and DBP (diastolic blood pressure), with the help of brand Omron digital sphygmomanometer (Model HEM-741CINT) with a cuff appropriate to the diameter of the child's arm. BP was measured on a single occasion, and averaged from three measurements, and classified according to the V Brazilian Guidelines on Hypertension (Mion Junior et al. 2006). All measurements were collected by a single researcher at the school during lecture time.

All students (n = 1224) enrolled in public schools (n = 6) of the municipality in 2010 were invited to participate in the study, was considered an exclusion criterion for the absence of the student signing the consent form by parent or guardian. At the end participated in the study 87.7% of students enrolled (n = 1074 students).

The data were organized in Excel for Windows. Statistical analysis was performed using the program Statistical Package for Social Sciences - SPSS 15.0 for Windows. Data were organized by the resources of descriptive statistics (frequency, percentage, mean and standard deviation). The distribution of data normality was checked by Kolmogorov-Smirvov. From the result of the tests were used for non-parametric statistics. Differences between mean values were verified with the aid of the Mann Whitney test and associations were found with the aid of the chi-square as a measure of effect was used odds ratio (OR). For all procedures we adopted the significance level of 95% (p <0.05).

The study followed the ethical principles for research involving human subjects and was approved by the Standing Committee on Ethics in Human Research of the Universidade Estadual de Maringá (556/2009).

RESULTS

Of the 1.074 schoolchidren enrolled, 531 were male (49.4%) and 543 (50.6%) were female.

The description of patients participating in the study are presented in Table 1.

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| Table 1: Anthropometric variables, age and blood pressure by sex, for children from 6.0 to 10.9 years enrolled in public schools in the city of Cruzeiro do Oeste / PR | | | | | | |
| Variables | Overall | | Male | | Female | |
|  | M (min~max) | | M (min~max) | | M (min~max) | |
| Age (years) \* | 8.3 | (6~10) | 8.3 | (6~10) | 8.2 | (6~10) |
| Weight (kg) \* | 31.7 | (14.4~103) | 32.2 | (15.1~103) | 31.3 | (14.4~81.7) |
| Height (m) \* | 1.33 | (1.00~1.77) | 1.33 | (1.02~1.73) | 1.3 | (1.00~1.77) |
| BMI (kg/m2) \* | 17.8 | (12~35.3) | 17.9 | (12.8~35.3) | 17.6 | (12~33) |
| WC (cm) \* | 63 | (38~123) | 62.7 | (38~123) | 63.2 | (47~107) |
| SBP (mm Hg) \* | 109.2 | (68~153) | 109.8 | (69~153) | 108.7 | (68~147) |
| DBP (mmHg) \* | 65.1 | (38~88.5) | 64.7 | (58~88.5) | 65.6 | (38~81) |
| \*M-mean; min-mínima; max-máxima | | | | | | |

The mean values for male schoolchidren for the variables measured were age 8.3 years, weight 32.2 kg, height 1.33 m, BMI 17.9 kg/m2, 62.7 cm CC, PAS 109, 8 mmHg and 64.7 mmHg and DBP among the female students these values were respectively 8.2 years, 31.3 kg, 1.30 m, 17.6 kg/m2, 63.2 cm, 108.7 mmHg and 65.6 mmHg. There were no significant differences between the sexes for all variables shown.

Table 2 presents the absolute and relative frequency of the variables according to sex.

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| --- | --- | --- | --- | --- | --- | --- |
| Table 2: Absolute and Relative Frequency of variables by sex | | | | | | |
| Variables | Overall | | Male | | Female | |
| NUTRITIONAL STATUS | N(%) | | | | | |
| Adequate\*\* | 791 | 73.6 | 410 | 77.2 | 381 | 70.2 |
| Overweight\*\* | 178 | 16.6 | 76 | 14.3 | 102 | 18.8 |
| Obese\*\* | 105 | 9.8 | 45 | 8.5 | 60 | 11 |
| WAIST CIRCUMFERENCE |  |  |  | N(%) |  |  |
| Desirable\*\* | 745 | 69.4 | 383 | 72.1 | 362 | 66.7 |
| Alterad\*\* | 329 | 30.6 | 148 | 27.9 | 181 | 33.3 |
| BLOOD PRESSURE |  |  |  | N(%) |  |  |
| Normal\*\* | 663 | 61.7 | 332 | 62.5 | 331 | 61 |
| High\*\* | 411 | 38.3 | 199 | 37.5 | 212 | 39 |
| Overall\*\* | 1074 | 100 | 531 | 49.4 | 543 | 50.6 |
| Test Chi-square p<0,05 \*\* Absolute and Relative Frequency | | | | | | |

The prevalence of obesity was 9.8% (n = 105), and 8.5% (n = 45) among male students and 11.0% (n = 60) among females, the prevalence of overweight showed 16.6% (n = 178), being 14.3% (n = 76) among males and 18.8% (102) among females. Therefore, the prevalence of overweight was 26.4%, while among girls the percentage was higher (29.8%) than boys (22.8%). Among the children studied, the prevalence of obesity was 30.6% (n = 329), being 27.9% (n = 148) and 33.3% (n = 181) for males and females, respectively. Had high blood pressure 38.3% (n = 411) of children, and among male students the prevalence of this change was 37.5% (n = 199) and among females was 39.0 % (n = 212). There were no significant differences between sexes for the variables presented.

Table 3 shows the distribution of anthropometric indicators (BMI and WC) according to the absence or presence of high pressure measurements.

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| Table 3: Association of anthropometric indicators according to the presence of normal blood pressure levels or altered | | | | | | |
| NUTRITIONAL STATUS | Normal blood pressure levels | | Altered pressure levels | | P | OR |
| (N,%) | | (N, %) | |
| Adequate | 543 | 68,6 | 248 | 31,4 | 0,000 | 1 |
| Excess Weight | 120 | 42,4 | 163 | 57,6 | 0,000 | 2,19 |
| WC |  |  |  |  |  |  |
| Desirable | 517 | 69,4 | 228 | 30,6 | 0,000 | 1 |
| Alterad | 146 | 44,4 | 183 | 55,6 | 0,000 | 2,02 |
| Test Chi-square p<0,05 OR – Odds Ratio (IC 95%) | | | | | | |

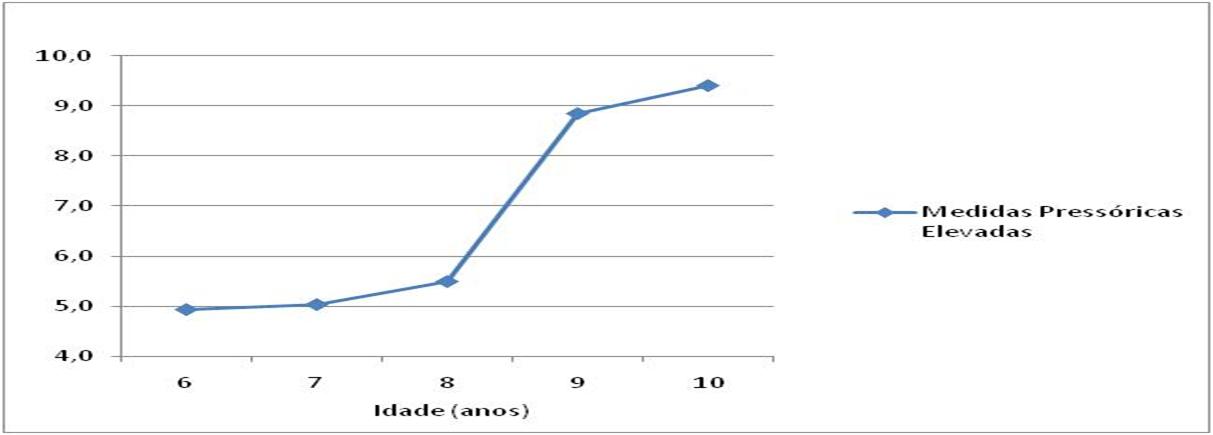
It is noteworthy that the altered pressure levels are considered and defined by the Brazilian Guidelines on Hypertension as a pressure equal to or above the 95th percentile of distribution of blood pressure taking into account age, sex and height of the child (MION JUNIOR, 2006).

Among the children studied 26.4% were overweight, in other words, 16.6% were overweight and 9.8% were considered obese. CC and pressure measurements were altered checked, respectively, in 30.6% and 38.3% of children (Table 2).

According to data presented in Table 3, it appears that all variables were associated with the presence of elevated pressure measurements. Among children with adequate nutritional status the absence of high pressure measurements occurred in 68.6% overall high pressure measurements occurred in 31.4% of children. When overweight was present, 42.4% of children have normal pressure measurements and pressure measurements were 57.6% higher (p=0.000).

Among students with DC desirable, 69.4% had normal pressure measurements and 30.6% high pressure measurements, in turn, among those who changed to CC, 44.4% had normal blood pressure measures pressure measurements and 55.6% higher (p=0.000).

When assessed the chances of a child has high blood pressure measures (RR), it was found that schoolchildren who are overweight had 2.19 times more likely to have high blood pressure measures in relation to students with appropriate and BMI, for children who WC had changed were 2.02 times more likely to have high blood pressure measures in relation to students with CC desirable (Table 3).



|  |  |
| --- | --- |
|  | High pressure  measurements |

Figure 1: Percentage of pressure measurements in high schoolchildren

In Figure 1 we can see the association (p = 0.000) between high blood pressure and age of children, and the percentage of students with high pressure measurements increases with age. At 6 years the percentage was 4.9% and the 10 years the percentage rises to 9.4%. At 8 years the percentage of students with high pressure measurements is 5.5% and it is noticed a growth spurt at age 9 when the percentage is 8.8% (p = 0.000).

DISCUSSION

Cardiovascular diseases (CVD) are considered the main causes of death in developed countries and many developing countries. These diseases develop over the life of a slow and gradual, and childhood as a starting point (MONEJO; GARDEN, 2006; KILCOYNE et al., 1974; ORELLANA, 1985; Bergmann, 2011).

The increasing prevalence of overweight and obesity among children and adolescents was reported by Monejo and Garden (2006) in several studies conducted in different regions of the country and constitutes an important warning sign for health authorities, since BMI above normal are associated with the development of various diseases, at early ages, among them, inadequate levels of blood pressure emphasizes the authors and because BMI is a strong indicator of the development of these diseases in adulthood (Christófaro et al. 2009), in the present study, a BMI above the normal values amounted to 26.4% similar result to the study of Gordia et al. (2011) found that 24.5% of children and adolescents are overweight in the metropolitan region of Curitiba, capital of Paraná State.

The increase in the percentage of children with altered blood pressure rises each year as a major factor of concern for infant health. The present study was quite high values (38.3%) when compared with the findings of Prati (2008) found that blood pressure changes of about 9.0% among 2598 children aged eight to ten years investigated in Maringá / PR, study Christófaro et al. (2009) carried out in Londrina / PR change in the prevalence of BP was 11.8% of 1,021 adolescents aged ten to seventeen, values greater than the previous study, but lower than the present study.

Some studies examined the influence of BMI and WC in the variation of the results of risk factors for CVD in children and adolescents (PARADIS et al., 2004, Janssen et al., 2002; WILLIANS et al., 2002). In three studies there was a direct association between BMI and WC with blood pressure. These results are confirmed by the study of Araújo et al. (2008).

The results presented by Amer et al. (2011) confirm the results obtained in this study in relation to the fact that the presence of hypertension and weight gain increases with age.

In a study of adults in Belém / PA, via telephone survey, was no association of age and overweight with hypertension in both sexes, and the risk of hypertension was equal to 1.80 in men and 2.49 in women in pre-obese, and 6.33 and 3.33 for men and women, respectively, obese (Borges, CRUZ, Moura, 2008).

In fact, the BMI of children is a powerful predictor of cardiovascular disease in adulthood, it is positively related to increased levels of fasting insulin, triglycerides, and systolic blood pressure, as well as scores of smaller high-density lipoproteins in adults (Christófaro et al., 2009).

Thus, the control measures BMI and WC are an important measure for reducing the levels of arterial hypertension and thus for promoting health and preventing cardiovascular diseases. In this sense, and Aydos Ferreira (2009) reported that hypertension in schoolchildren aged 7-14 years, was found significantly from children with excess body weight and educational measures are needed to promote change within that framework.

Santos and Rabinovich (2011) point out that obesity is a chronic, very complex, involving environmental and genetic factors with environmental factors and that are primarily responsible for much of childhood obesity in Brazil and worldwide.

FINAL CONSIDERATIONS

The study investigated the relationship between anthropometric indicators and blood pressure in schoolchildren, considered risk factors for cardiovascular disease (CVD) in adulthood. We used the school as a research area in view of its role in formal education, fundamental in the formation of habits.

The results show that 26.4% of schoolchildren are overweight and 30.6% of students have abdominal obesity and 38.3% of them have high blood pressure and also with 31.4% of state have adequate nutritional high blood pressure.

It is important to emphasize that not only the incidence of childhood obesity is increasing, but also its magnitude. Obese children have a higher risk than non-obese to become obese adults.

Increased body fat is true risk factor for raising the blood pressure resulting in high pressure measurements starting increasingly early. The general and central deposition of fat seems to behave as a true risk factor, because it has an association with high blood pressure.

In recent years, Brazilian society has gone through major cultural changes that have altered behaviors and habits, in part directly affecting children. Unlike their parents and grandparents, children do not enjoy space to play, before walking to cycling, playing ball is in the "fields" improvised and performed various games involving running, jumping, spinning and a multitude of body movements today the habits and behaviors are very different children are isolated within their homes in the company of electronic games, televisions and computers.

For that reason we emphasize that the school plays a key role in contributing to the formation of good habits and behaviors of students on lifestyle including the basics of healthy eating and physical exercise and physical education classes with redemption of fun and games so forgotten by today's children.

Therefore, the results indicate that the fight against increased adiposity in childhood should be a public health issue in view of its strong association with the emergence of important diseases in childhood, such as hypertension, which is become chronic and aggravate adulthood giving rise to many other serious diseases, such as cardiovascular diseases.

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