EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 4
Issue: 11
27-31
Year: 2017

PREVALENCE OF EXCESS WEIGHT IN STUDENTS FROM NORTHEASTERN BRAZIL

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Article Received on 02/09/2017 **Article Revised on 23/09/2017** **Article Accepted on 13/10/2017**

ABSTRACT
Objective: To assess the prevalence of the excess weight in adolescents from São Luís, Maranhão, Northeastern Brazil. **Subjects/Methods:** Cross-sectional study with a sample of 513 students aged 10-19 years from public schools of São Luís, Maranhão. The following indicators were assessed: weight, height, age, body mass index (BMI), waist circumference (WC), conicity index (C index) and weight-to-height ratio (WHtR). Descriptive analyses, Anova-One-Way test and frequencies were used for data analysis. **Results:** The prevalence of excess weight, abdominal adiposity and altered waist-to-height ratio (WHtR) in the sample were 41.91% (n = 215), 32.55% (n = 167) and 26.51% (n = 136), respectively. After the sample divided into three groups, stratified by nutritional status, and called eutrophic (n=298), overweight (n=133) and obesity (n= 82). The obesity group presented a higher mean of the analyzed variables: body mass index (BMI), waist circumference (WC) and WtHR. The prevalence of abdominal adiposity and altered WtHR were higher in obesity group. **Conclusion:** The prevalence of cardiometabolic risk factor was higher in adolescents with excess weight. We recommend the implementation of measures to prevention/explanation in schools in order to reduce the prevalence of overweight in this age group.

KEYWORDS: Obesity, Adolescents, Antropometric index, schoolchildren.

INTRODUCTION
Obesity can be defined as excessive accumulation of body fat that causes harms to health of individual, as a consequence of the positive energetic balance. Clinical and epidemiologic studies established that the distribution of the body fat is related to a list to cardiovascular risk factors both in adults how as in children and teenage.[1]

According to the report "*Ending Childhood Obesity*" from the World Health Organization (2016)[2] the number of overweight children in low-middle-income countries has more than doubled, from 1990 to 2014, from 7.5 to 15.5 million. In Brazil, the "*Family Budgeting Report"* (2008-2009)[3] found that the prevalence of overweight and obese adolescents was 20.5% and 4.9%, respectively. In a research carried out in the Northeastern region of Brazil, Bloch et al. (2016)[4] found that 6.8% of the girls and 8.1% of the boys were obese.

The nutritional status of a patient can be evaluated by different methods, however, the widely used one and universally diffused are the anthropometric measures, as they have the advantage of being a simple, low cost and innocuous method, besides showing high performance in the prediction of visceral fat and cardiovascular risk.[1] The relation between the development of cardiovascular diseases and risk factors such as obesity (mainly visceral fat)[5] is already well established. However, for a long time the tracking of these risk factors was considered important only in populations with old age. Despite that,

recent studies have shown that the presence of these changes is already a reality among young adults and even among children and adolescents.[5] Therefore, it is very important to carry out studies aimed at evaluating the prevalence of excess weight and central adiposity in child and adolescent population as a way of avoiding health problems in this population. Thus, the present study aims to evaluate the prevalence of overweight in schoolchildren.

MATERIALS AND METHODS

Subjects

This is a cross-sectional study. The target population of this study consisted of adolescents of both genders, aged 10-19 years, enrolled in municipal, state and federal schools of São Luís, Maranhão, Brazil. The sample size was determined by estimating a proportion[6]based on a prevalence of overweight in adolescents of 20.5%,[3]a suggested outcome prevalence of 26.9%,[7] tolerable error of 5% (type I error) and power of the test of 85% (type II error), reaching 427 individuals with an additional 20% for possible losses or refusals, which resulted in a sample of 512 adolescents. According to the plan, the result was a final sample of 513 students.

All adolescents and their parents/guardians were informed about the study procedures and the possible risks before giving written informed consent to participate. The study was approved by the Ethics Committee of the *Hospital Universitário da Universidade Federal do Maranhão* through the protocol number 251/11. Exclusion criteria were the presence of physical deficiencies (permanent or temporary) which made assessment impossible, pregnancy, breastfeeding, use of contraception, non-agreement of parents or students, and absence on the assessment day.

Evaluation

All measurements have been taken by a single investigator with same instrument; therefore, intra and inter observer variability for taking measurements were not significant. Decimal age was calculated as the difference between date of birth and date of data collection.[8]

Anthropometric measurements including weight, height, waist circumference (WC), were obtained using standardized techniques by well-trained interviewers.[9] They were performed in all participants wearing light clothes and without shoes. Body weight was measured and recorded within 0.1 kg with a calibrated electronic flat scale (Seca® 803, Hamburg, Germany). Height was measured and recorded with an accuracy of 1 mm with a portable stadiometer (Seca® 213, Hamburg, Germany). Body mass index (BMI) was calculated as weight (kg) divided by squared height (m^2). Based on the WHO 2006/2007[10] percentiles for gender and age, the adolescents were classified according to their nutritional status into: normal weight if ≥ percentile (p) 3 and < percentile (p) 85, overweight ≥ p 85 and < p 97 and obese ≥ p 97.

The WC was measured using a non-stretchable measuring tape, without any pressure to body surface, and was recorded to the nearest 0.1 cm (Seca® 213, Hamburg, Germany). Measurements were taken in duplicate and the mean considered for analysis. Subjects were asked to stand erect in a relaxed position with both feet together on a flat surface. WC was measured as the smallest horizontal girth between the costal margins and the iliac crests at minimal respiration. For the classification of elevated WC, the criteria proposed by Taylor et al. (2000)[11] were used. Waist-to-height ratio (WHtR) was calculated by using the formula:[WC (cm)/height (cm)];[12] For the classification of altered WHtR, the criteria proposed by Ashwell & Hsieh (2005).[12] To avoid subjective error, all measurements were taken by the same person.

Statistical Analysis

The SPSS® version 23 (Statistical Package for the Social Sciences, Chicago, IL, USA) was used for database and statistical analysis. The results were expressed as mean, median, standard deviation (mean or median ± SD) and frequencies. The normal distribution of the data was tested using the Kolmogorov-Smirnov test. The assessment of the means between the three groups was carried out with Anova-One-Way test. For all tests, statistical significance was established at p-value < 0.05.

RESULTS

Participants were 513 adolescents with a mean age of 14.53 years ± 2.23 years. The prevalence of excess weight, abdominal adiposity and altered waist-to-height ratio (WHtR) in the sample were 41.91% (n = 215), 32.55% (n = 167) and 26.51% (n = 136), respectively.

After the sample divided into three groups, stratified by nutritional status, and called eutrophic (n=298), overweight (n=133) and obesity (n= 82); Table 1. The obesity group presented a higher mean of the analyzed variables: body weight, body mass index (BMI), waist circumference (WC) and WtHR.

Table 1: Characteristics of participants stratified by nutritional status.

Variables	Eutrophic (n=298)	Overweight (n=133)	Obesity (n=82)	P-value
Age (years)	14,87±2,15	14,21±2,20	13,83±2,34	<0,001
Height (m)	1,57±0,09	1,57±0,08	1,58±0,08	0,529
Body Weight (kg)	48,82±9,09	60,19±10,05	72,35±14,78	<0,001
BMI (kg/m²)	19,45±2,37	24,18±2,09	28,51±3,67	<0,001
WC (cm)	66,49±7,48	78,22±7,07	85,10±11,85	<0,001
WHtR	0,42±0,04	0,49±0,04	0,54±0,07	<0,001

Abbreviations: BMI- body mass index; WC-waist circunference; WHtR - waist-to-height ratio. Anova-One-Way test. Values are given as (Mean ± SD - standard deviation).

The Table 2 shows the prevalence of gender and risk factors of participants stratified by nutritional status. The prevalence of abdominal adiposity 80.49% (n=66) and altered WtHR 73.17% (n=60) were higher in obesity group.

Table 2: Prevalence of gender and risk factors of participants stratified by nutritional status.

Variables	Eutrophic	Overweight	Obesity
Gender			
Female	70,80% (n=211)	74,43% (n=99)	62,19% (n=51)
Male	29,20% (n=87)	25,57% (n=34)	37,81% (n=31)
WC			
Normal	92,95% (n=277)	39,84% (n=53)	19,51% (n=16)
Altered	7,05% (n=21)	60,16% (n=80)	80,49% (n=66)
WHtR			
Normal	95,97% (n=286)	51,87% (n=69)	36,83% (n=22)
Altered	4,03% (n=12)	48,13% (n=64)	73,17% (n=60)

Abbreviations: BMI- body mass index; WC-waist circumference, WHtR - waist-to-height ratio. Values are given as Percentage (%) and frequencies (n).

DISCUSSION

Obesity has been considered by the World Health Organization (WHO) as a worldwide epidemic[13] the report "World Health Statistics 2012" (WHO)[14] pointed out that 12% of the world population is obese and this is the cause of 2.8 million people per year. The American continent accounts for the largest share of obese people in the world 26% of the adult population.[15]

In the evaluated sample, the prevalence of eutrophy (58.1%) was greater than the presence of excess weight (41.9%). However, it should be noted that the prevalence of overweight and obesity has increased in the last decades and is related to the appearance of various comorbidities such as cardiovascular diseases and metabolic disorders (blood pressure elevated, dyslipidemia, among others).[16]

In addition, there is evidence that 20% of obese children before reaching age five tend to become adults withnutritional disorder and when this morbidity reaches the adolescent group, the proportion may increase to 80%.[17] Faced with this alarming situation, the need for investigations and actions aimed at changing this scenario is reinforced.[17] The presence of excess weight and its distribution in the upper body (visceral fat) are one of the main risk factors for the development of cardiovascular diseases. Among the most commonly used methods for assessing body fat distribution, we highlight waist circumference.[18]

In the present study, a high prevalence of altered WC was observed in the overweight and obesity group. This fact is of great importance since WC is considered the best indicator of visceral fat and cardiovascular risk factors when compared to BMI.[19] In addition to the fact that children and adolescents with cardiovascular risk such as dyslipidemia can be screened only on the basis of WC measurement.[20]

There was also a high prevalence of altered WHtR in the studied population. The WHtR is an indicator of increasing use, being a good marker to assess overweight in adolescents[21]and has been proposed as a measure of cardiovascular risk regardless of gender and age.[22] In a study with 1,268 adolescents aged 15-17 years in Southern Brazil, Pelegrine et al. (2015)[23] found that waist circumference (WC) and WHtR have sufficient similarity to discriminate body fat.

Already Carneiro et al. (2014)[24]in a sample composed of 148 schoolchildren from São Paulo / SP, from 10 to 19 years old, observed that WC and WHtR showed a greater predictive power of insulin resistance in adolescents. Thus, the high prevalence of risk factors such as excess weight, adiposity and altered WHtR, in the sample studied, underscores the need to implement preventive measures aimed at reducing the prevalence of overweight and obesity in the juvenile population, thus preventing the development of comorbidities associated

with obesity such as hypertension, dyslipidemias, insulin resistance in this population

CONCLUSION

Thus, the high prevalence of risk factors such as excess weight, adiposity and altered WHtR, in the sample studied, underscores the need to implement preventive measures aimed at reducing the prevalence of overweight and obesity in the juvenile population, thus preventing the development of comorbidities associated with obesity such as hypertension, dyslipidemias and insulin resistance in this population.

ACKNOWLEDGMENTS

The authors would like to thank the School Board of Directors, students and their parents or next of kin for their participation in the study. This study was supported by grants from the *Fundação de Amparo à Pesquisa e ao Desenvolvimento Científico e Tecnológico do Estado do Maranhão (*FAPEMA, Process BD-07113/16*).*

Conflict of interest

The authors declare no conflict of interest.

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