ORIGINAL ARTICLE

Weight excess in adolescents in Belo Horizonte: population-based household survey

Excesso de peso em adolescentes de Belo Horizonte: inquérito domiciliar de base populacional

Stephanie Bispo[1], Adriana Lúcia Meireles[2], Marcela Guimarães Côrtes[3], César Coelho Xavier[4], Fernando Augusto Proietti[5], Waleska Teixeira Caiaffa[6]

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ABSTRACT

Introduction: Weight excess rates have had an alarming growth among adolescents. Of complex and multifactor origins, weight excess is influenced by genetic and contextual factors. **Objective:** To assess individual factors related to weight excess among adolescents in a large urban center. **Methods:** A cross-sectional study with data from a population-based household survey conducted in two districts of Belo Horizonte, between 2008 and 2009. Data were collected through confidential self-administered questionnaires and anthropometric measurements. The final sample consisted of 1,030 adolescents aged 11-17 years. We evaluated excess weight, as defined by body mass index, and its association with sociodemographic variables, habits and lifestyles, body satisfaction and self-rated health. Descriptive analysis of the data, including frequency distributions and differences between proportions and means with the Pearson chi-square test were conducted. **Results:** 21.9% of adolescents were overweight, with a higher prevalence among females (54.2%, p <0.05). The following aspects were significantly associated with weight excess: not eating breakfast, body dissatisfaction and worse self-rated health status. Males were more active compared to females, however without significant differences in nutritional status classifications. **Conclusion:** This study reinforces the multifactor aspects of excess weight in adolescents and the importance of investing in preventive measures of obesity in this age group.

Key words*:* Obesity; Adolescent; Life Style; Urban Health.

RESUMO

Introdução*: o excesso de peso tem incidido de forma alarmante entre adolescentes. Sua origem é complexa e multifatorial, influenciada pela genética e por fatores contextuais.* **Objetivo:** *avaliar fatores individuais relacionados ao excesso de peso em adolescentes em um grande centro urbano.* ***Métodos****: estudo transversal com dados provenientes do inquérito domiciliar de base populacional realizado em dois distritos de Belo Horizonte, entre 2008 e 2009. Os dados foram obtidos por meio de questionário confidencial e autoaplicado e avaliação antropométrica. A amostra final foi composta de 1.030 adolescentes de 11 a 17 anos. Avaliou-se o excesso de peso segundo o índice de massa corporal e sua associação com variáveis sociodemográficas, hábitos e estilos de vida, satisfação corporal e autoavaliação de saúde. Foram realizadas análises descritivas dos dados, incluindo as distribuições de frequências e as diferenças entre as proporções e médias pelo teste qui-quadrado de Pearson.* ***Resultados****: entre os adolescentes, 21,9% apresentaram excesso de peso, sendo que a mais alta prevalência foi no sexo feminino (54,2%, p<0,05). Foram significantemente associadas ao excesso de peso: não ter hábito de fazer desjejum, insatisfação corporal e pior autoavaliação de seu estado de saúde. Os indivíduos do sexo masculino eram mais ativos comparados aos do sexo feminino, porém sem diferença estatística entre classificações do estado*

[1] Nutritionist. MSc student in Health Sciences: Child and Adolescent Health – School of Medicine, Universidade Federal de Minas Gerais (UFMG). Urban Health Observatory. Belo Horizonte, MG – Brazil.
[2] Nutritionist. PhD student in Public Health – School of Medicine, UFMG. Urban Health Observatory. Belo Horizonte, MG – Brazil.
[3] Speech Therapist. PhD student in Public Health – School of Medicine, UFMG. Urban Health Observatory. Belo Horizonte, MG – Brazil.
[4] Physician. Associate Professor of the Department of Pediatrics, School of Medicine, UFMG. Urban Health Observatory. Belo Horizonte, MG – Brazil. Professor at the Faculdade de Saúde e Ecologia Humana (FASEH). Vespasiano, MG – Brazil.
[5] Physician. Associate Professor of the Department of Social and Preventive Medicine of the School of Medicine, UFMG. Urban Health Observatory. Belo Horizonte, MG – Brazil. Professor at the Faculdade de Saúde e Ecologia Humana (FASEH). Vespasiano, MG – Brazil.
[6] Physician. Professor of Epidemiology – Department of Preventive Medicine at the School of Medicine, UFMG. Urban Health Observatory. Belo Horizonte, MG – Brazil.

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Institution:
School of Medicine, UFMG
Urban Health Observatory of Belo Horizonte
Belo Horizonte, MG – Brazil

Corresponding Author:
Stephanie Bispo
E-mail: tefabispo@hotmail.com

*nutricional. **Conclusão**: este estudo reforça a importância da característica multifatorial do excesso de peso em adolescentes e de se investir em ações preventivas da obesidade nessa faixa etária.*

***Palavras-chave**: Obesidade; Adolescente; Estilo de Vida; Saúde da População Urbana.*

INTRODUCTION

Excess weight, including both overweight and obesity, is defined as the accumulation of abnormal or excessive fat in the body. It can be harmful to health,[1-3] and has increased alarmingly among children and adolescents. A 2008 world estimate showed that among the 15+ population there were 1.6 billion overweight and 500 million obese individuals.[2] Although prevalence is higher in developed countries, developing countries also experience a marked increase in excess weight, specially after urbanization and economic growth.[4,5]

The Brazilian Household Budget Survey, (POF, in Portuguese)[6], carried with 55,970 respondents, found a total of 20.5% excess weight in the nutritional status analysis of adolescents aged 10-19 years. The most affected regions were Southern and Southeastern Brazil. For both sexes, approximately a fifth of all adolescents had excess weight; among these, one quarter was obese. The results found in the POF for this age group show not only an increase, but also a trend for accelerated increase in the overweight and obesity rates in Brazil.

Adolescent overweight/obesity has been associated with risk factors for coronary artery disease. Moreover, adolescent excess weight is a strong predictor of obesity in adult life, cardiovascular diseases and early death.[7,8] Overweight/obesity at ages 14-19 tend to persist into adulthood and are associated with increased mortality starting at age 30 for various systemic diseases.[2,9]

Obesity and overweight result from complex and multifactor origins, being influenced by genetic, individual, situational, and environmental factors. The epidemic proportions of increased adiposity suggests that the environment has a more significant role than genetics itself.[1,10] The urban environment is believed to be strongly associated with weight gain due to the availability of less healthy lifestyles, which directly influence food intake and energy expenditure (through lower physical activity and sedentary lifestyles).[11-13]

A better understanding of the factors associated with this world epidemic is urgently needed and may contribute to creating programs for changing this critical public health situation.[13-15]

The aim of this study was to evaluate the prevalence of excess weight and related individual factors among adolescents in a large urban center.

METHODS

Study Design

This study is a cross-investigation of data collected from a population-based household survey called "Estudo Saúde em Beagá", developed by the Urban Health Observatory of Belo Horizonte (OSUBH), part of the Universidade Federal de Minas Gerais, in two health districts of the city of Belo Horizonte, namely the Barreiro and West districts, between 2008 and 2009.[16,17]

The stratified sampling by clusters was adopted in three phases: random selection of census tract (CT), followed by random selection of household, resident adult (≥ 18 years of age) and resident adolescent (11-17 years of age), using the methodology established by Marques & Berquó (1976).[18] Permanently or temporarily disabled individuals were excluded.

Data Collection

Information on adolescents was collected using confidential, self-administered questionnaires prepared by the researchers of OSUBH and anthropometric evaluations of weight, height and waist circumference, carried out by trained professionals. The research tool was based on studies by UNICEF, the Birth Cohort Study at CPE/UFPel in Pelotas/RS and the National Survey of School Health by the Brazilians Institute of Geography and Statistics, IBGE.[19-21]

Weight was measured using TANITA BF 542® scales, with a total capacity of 136 kg and 0.2 kg range. Height was measured with an anthropometer with a 110 to 204 cm range in millimeters. Weight and height were each measured twice for greater consistency and average was calculated thereafter. All measurements were taken following the standards recommended by the Food and Nutrition Surveillance System.[22]

Study Variables

The dependent variable was calculated based on the Body Mass Index (BMI) classified by age group and according to the cutoff points recommended by the WHO.[23] Individuals were grouped into "thinness" (those up to P3) "eutrophy" or normal range (for those individuals between P3 and P85) and "overweight" for P > 85.

The independent variables were grouped into sociodemographic variables such as age, sex, and socioeconomic level, as well as lifestyle variables, such daily time spent watching television and playing *video games*, practicing of physical activity, and breakfast and fruit consumption. Physical activity was classified based on PeNSE[21], and those who exercised for 300 minutes or more per week were considered active. Total physical activity was assessed computing activities during school commute (walking or cycling), Physical Education classes at school and other extracurricular physical activities during the week. Adolescents were thus classified as inactive (physically active for zero to 199 minutes per week); insufficiently active (199 to 299 minutes per week); and active (300 minutes or more of physical activity per week). We also assessed adolescent body perception and self-assessed health. Body satisfaction was evaluated using the silhouette scales developed for the Brazilian population by Kakeshita[24], which requires adolescents to indicate the silhouette that best represents the current shape of their body as well as the silhouette they would most like to resemble. Body dissatisfaction was understood as any degree of discrepancy between current and desired silhouettes. Health self-assessment was measured by asking: "in general, do you think of your health to be very good, good, fair, poor or very poor?"

Data Analysis

Descriptive analyzes of the data, including the calculation of frequency distributions, were performed. The differences between proportions and the exposure variables means were assessed using Pearson chi-square test. The cluster sampling process was considered in the analyses, through the "svy" commands in Stata 10.0.

Ethical Issues

The project was approved by the Ethics and Research Committee of the Universidade Federal de Minas Gerais – Opinion nº ETIC 253/06 – extension 01/08. Participation by adolescents was voluntary and all information was confidential. Two Informed Consent Forms (ICF) were used, one signed by parents or guardians and the other by the adolescents themselves.

RESULTS

The study population consisted of 1,030 adolescents aged between 11 and 17 years, median age 14 (13.8 to 14.1) years, and 52.5% male. The remaining variable frequencies are shown in Table 1.

These adolescents' BMIs were very close to the normal distribution when measured both in kg/m² and in z score (Figure 1). For this reason, we chose to use BMI in kg/m² classified according to the percentile cutoff points recommended by the World Health Organization.[23]

Table 1 - Table of frequency of sociodemographics and lifestyle habit variables among adolescents aged 11-17 years in two districts of Belo Horizonte, 2008 - 2009

Variables	Category	n	Frequency* (%)
Age (years)	11-13	(1042)	41,9
	14-17		58,1
Type of family	Nuclear	(1037)	64,3
	Blended		12,4
	Single Parent		23,3
Income (Minimum Wages)	< 2	(1026)	30,0
	2 a <5		45,4
	5 a 10		14,4
	>10		10,2
Type of school	Public	(978)	85,4
	Private		14.6
Education Level of the head of the household (in years of study)	0-4	(1029)	31,4
	5-8		23,8
	9-11		27,8
	≥12		17,0
Practice of Physical Activity	Inactive	(1004)	11,6
	Insufficiently active		47,8
	Active		40,6
Time watching TV (hours/day)	1 – 2	(1029)	26,4
	2 – 3		15,8
	>3		57,8

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Table 1 - Table of frequency of sociodemographics and lifestyle habit variables among adolescents aged 11-17 years in two districts of Belo Horizonte, 2008 - 2009

Variables	Category	n	Frequency* (%)
Use of video game console or computer	Up to 1	(1033)	52,5
	1 to 2		14,5
	Above 2		32,0
Breakfast	< 3x per week	(1037)	64,3
	> 3x per week		35,7
Fruit consumption	Every day	(1038)	34,8
	Sometimes		44,1
	Rarely		21,1

* Frequencies were obtained using the "svy" command considering the sampling process by clusters.

Among respondents, 21.9% had excess weight (8.1% obese and 13.8% overweight). Table 2 shows the distribution percentage per nutritional status classification (BMI) in relation to sociodemographic variables. Excess weight was more prevalent among females (54.2%), with a statistically significant difference between sexes (p=0.01). Adolescents living in families whose income was lower than two minimum wages showed a tendency to thinness and those whose income was higher to excess weight. Among those whose household income was above 10 minimum wages, eutrophy and excess weight were comparable. The impact of going to a private or public school revealed patterns that differed from those of income. When the head of the family had a lower education level, the proportion of adolescents at the extremes of BMI (thinness and excess weight) increased. The opposite can be observed for those whose parents had 12 or more years of study, with only 12.3% of adolescents in the thinness and excess weight categories.

Variables related to habits and life styles, with the exception of eating breakfast every morning, showed no statistic association with BMI (Table 3). We also noted that sedentary lifestyles followed the trend that increased inactivity, measured by time spent in front of the television, increased proportionally to excess weight. We also observed that male adolescents were more active than females (45.21% *versus* 35.37%, value p=0.007), but no statistically significant differences were recorded among the overweight and obese and those with normal weight.

Adolescents with excess weight had worse health perceptions, compared with eutrophic adolescents, and were more dissatisfied with their bodies (17.10 *versus* 8.60, value p =0.003; 91.54 *versus* 76.62, value p<0.001).

DISCUSSION

This study assessed the prevalence of excess weight among 1,030 adolescents aged 11 to 17 years by means of a population-based household survey in two health districts of Belo Horizonte. The prevalence of excess weight (21.9% = 13.8% overweight + 8.1% obesity) found in adolescents in this study was similar to the national prevalence (20.5%, according to the Household Budget Survey – POF)[6], as well as that observed among 9th grade students in Belo Horizonte (21.2% - PeNSE)[21] and adolescents in a school-based study in the city of Montes Claros/MG (20.7%).[25]

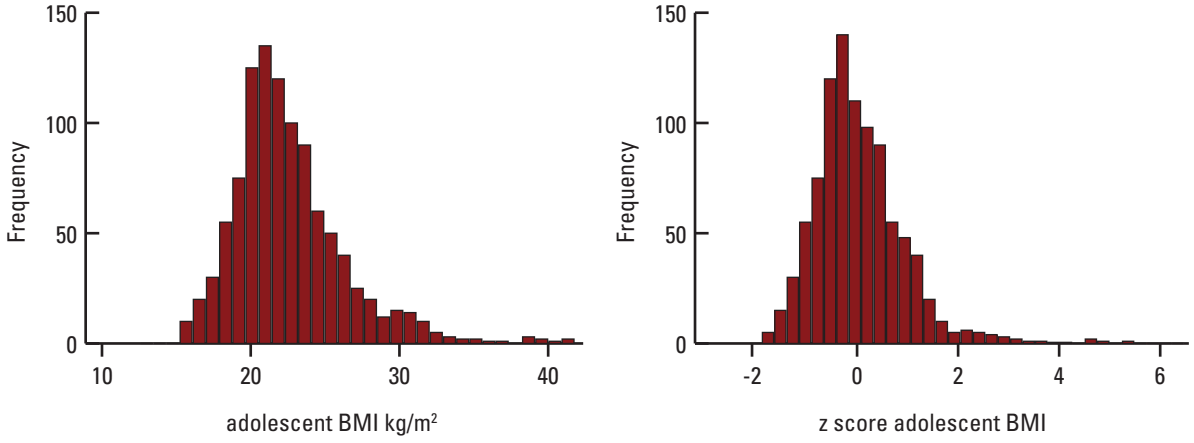

Figure 1 - Histogram with BMI in kg/m2 and z-score of 1,030 adolescents aged 11-17 years in two districts of Belo Horizonte, 2008-2009.

Table 2 - Proportional distribution of thinness, eutrophy and overweight by sociodemographic variables among adolescents aged 11-17 years in two districts of Belo Horizonte, 2008-2009 (n=1030)

Variables	Category	Thinness n = 47 (%)	Eutrophy n = 757 (%)	Overweight n = 226 (%)	Value p
Age (years)	11-13	40,1	49,6	46,2	0,30
	14-17	59,9	50,4	53,8	
Sex	Female	46,8	26,7	54,2	0,01
	Male	53,2	73,3	45,8	
Type of family	Nuclear	71,8	63,5	64,0	0,57
	Blended	9,0	13,6	10,0	
	Single Parent	19,3	22,7	26,0	
Income (minimum wages)	< 2	55,8	29,7	26,9	0,06
	2 a < 5	30,5	46,7	48,1	
	5 a 10	6,9	13,7	16,0	
	> 10	6,8	9,9	9,0	
Tipo de escola	Public	89,7	85,8	83,0	0,51
	Private	10,3	14,2	17,0	
Education Level of the head of the household (in years of study)	0-4	29,0	26,9	31,2	0,09
	5-8	43,0	30,1	36,1	
	9-11	15,7	31,9	20,4	
	≥12	12,3	11,1	12,3	

*Frequencies were obtained using the "svy" command considering the sampling process by clusters.

Table 3 - Proportional distribution of thinness, eutrophy and overweight according to habits and lifestyle among adolescents aged 11-17 years in two districts of Belo Horizonte, 2008-2009 (n=1030)

Variables	Category	Thinness n = 47 (%)	Eutrophy n = 757 (%)	Overweight n = 226 (%)	Value p
Practice of Physical Activity	Inactive	6,2	12,5	9,6	0,47
	Insufficiently active	56,6	46,4	52,4	
	Active	37,2	41,1	38,0	
Time watching TV (hours/day)	1 – 2	31,9	27,8	21,1	0,36
	2 – 3	13,7	14,9	19,7	
	> 3	54,4	57,4	59,2	
Use of video game console or computer (hours/day)	Up 1	64,9	52,6	54,2	0,48
	1 to 2	8,1	15,3	12,6	
	Over 2	27,0	32,0	33,2	
Breakfast	< 3x per week	18,8	34,9	41,2	0,03
	> 3x per week	81,2	65,1	58,8	
Fruit consumption	Every day	23,3	35,1	37,3	0,15
	Sometimes	62,4	44,1	39,5	
	Rarely	14,3	20,8	23,2	

*Frequencies were obtained using the "svy" command considering the sampling process by clusters.

As to sex, although the findings in this study corroborate those of other population- and school-based studies in that the proportion of excess weight among females is higher than in males[12,25,26], the POF reveals that boys have been the target of more frequent concern because the frequency of obesity increases significantly with time for this group. According to that research, between 1974 and 2009 the prevalence of

excess weight among boys increased by about six times (from 3.7% to 21.7%).[6]

Socioeconomic level was not statistically associated with excess weight in this study, despite showing a borderline p value and. BMI also tended to increase proportionally to income, up to 10 minimum wages. According to 2008-2009 POF, the prevalence of excess weight has shown steady growth with income. Nevertheless, over time, the prevalence of overweight and obesity among the low-income population has also increased. In the past, excess weight was commonly observed among those with high socioeconomic status, while poverty used to be associated with malnutrition. It is known that the nutrition transition in low-income countries is marked by rapid growth rates of overweight and obesity in groups of high socioeconomic status. However, over time, this situation is reversed and comes closer to that observed in high-income countries, with a low prevalence of obesity in high income classes, attributed in some studies to increased access to information about healthier dietary patterns and physical activity. [27-29]

We believe that Brazil has already started the process of reverting that initial picture. According to an analysis by the Institute of Applied Economic Research on the results obtained through the 2008 National Household Sample Survey (PNAD)[30], there is compelling evidence to the decline in income inequality in Brazil and to the increased access to goods among households with per capita income of less than half the minimum wage, meaning that current poverty is characterized by greater access to consumer goods and services, including food.

Despite being well established in several studies, the relationship between lack of physical activity and unhealthy eating habits associated with excess weight, the results differ from one study to another. Population studies such as that of Silva *et al.*[31] found no such association, while school-based studies reported an association[32,33], maybe due to methodological differences or reverse causality, and possibly indicating a new picture of the prevalence of obesity that has yet to be understood. The justification for reverse causality include more state and municipal investment in health programs, raising awareness about healthy habits and behaviors and causing overweight/obese adolescents to seek healthier lifestyles and increase physical activity.[34] The same could explain why the nutritional status was not associated with fruit intake.

A sedentary lifestyle showed no statistical association with excess weight in this study, despite the trend associating more time spent watching television and overweight/obesity. Some studies argue that time spent watching television may not directly affect weight, but can contribute both for a sedentary lifestyle and excessive energy intake, given that while spending hours in front of the television individuals are more exposed to the advertising of unhealthy food.[35,36]

Skipping breakfast has been identified as an important factor associated with excess weight in several previous studies.[12,33,37] An analysis of body constitution of adolescents aged 14 and 15 by Alexander *et al.*[37] showed that those who did not have the habit of eating breakfast presented with increased intra-abdominal fat tissue and high BMI, regardless of the type of food consumed.

It can also be argued that enrollment in private or public schools fails to distinguish between household incomes given that families with average income will enroll their adolescents in either type of institution.

Data on the nutritional status of Brazilian adolescents are still limited, specially regarding overweight and obesity. BMI classification for that age group is still not unanimous, given the interference of growth and body size on nutritional status. However, most of these studies are based on samples of students or of outpatient clinics, and thus, are not representative of the Brazilian population. In contrast, this study distinguishes itself by being conducted using randomly selected households from a population-based sample.

A limitation of this study is the lack of quantitative or qualitative information on the consumption of certain foods, common among adolescents, such as soft drinks, *fast-food*, fried food and sweets. This information is vital given that diet is a highly relevant factor in the development overweight and obesity, and relates to the profiles of pubertal overweight and obesity. Another limitation relates to the cross-sectional design of the study, which stops us from stating whether excess weight is caused by explanatory variables or vice-versa. Nevertheless, this work is of great importance, considering there are few population-based studies on the profile of adolescents with excess weight. We here emphasize that biases due to selection of assessment of measures were minimized through great methodological rigor in the sampling process, training of interviewers for correct data collection and anthropometric measurements, as well as in the development of the steps related to data management and analysis.

CONCLUSION

The findings of this study reinforce the multiple etiology of excess weight in adolescents and the importance of investing in preventive measures for controlling obesity in adolescents as a way to reduce the problem of overweight/obesity in the country.

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