

Prevalence and Associated Factors of overweight in Adolescents From Salvador, Bahia, Brazil



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ABSTRACT

Objective: To estimate the prevalence and identify associated factors of overweight in adolescents. **Methods:** a cross-sectional study design was employed. 426 adolescents, 10 to 18 years old, from the city of Salvador, northeast region of Brazil were selected in a three stage stratified random sampling scheme. Data on the frequency of food consumption and physical activity, sexual maturation, anthropometric measurements and covariates were collected. The nutritional status was classified with cutoff points based on body mass index mean values from Brazilian children and adolescents, while the secondary sexual characteristics were self-reported. The adolescents who performed more than 300 minutes of moderate physical activity per week were considered physically active. Ethnicity was classified by skin color and physical attributes. **Results:** Total prevalence of overweight was of 14.3%. Early sexual maturation (Prevalence Rate - /PR/_adjusted =2.12, /CI95%/ =1.10-4.05) and physical inactivity (/PR/_adjusted =1.85, /CI95%/ =1.01-3.41), adjusted for age (PR/adjusted =1.77, /CI0.97%/ =3.24) were independently associated with overweight in adolescents from Salvador, Bahia. **Conclusions:** overweight was high among adolescents in Salvador. Public prevention policies should be adopted in order to early prevent overweight through improved encouragement to continuous and systematic practice of physical activity at population level.

Keywords: body mass index, overweight, physical activity, adolescence.

INTRODUCTION

Prevalence of overweight and obesity in childhood and adolescence has remarkably increased in the last decades. The increase of this event has tripled around the world over this period, being similar in developed and under development countries⁽¹⁾. In Brazil, the prevalence of overweight increased from 3.9% (1974-1975) to 17.9% (2002-2003) in boys, and from 7.5% to 15.4%, in girls aged between 10 and 19 years, in that same period⁽²⁾. In children between six and nine years of age, increase from 4.4% (in 1974-1975) to 13.9% (in 1997) was recorded⁽³⁾.

Currently, there is a consensus that overweight and obesity should be fought early, since they constitute risk factors to other morbid mortalities⁽¹⁾ both in the life stage and in following stages. Therefore, it is crucial to understand the determinant elements associated with these events in childhood and adolescence, as the evidence indicates that variations in ethnic composition, life style as well as health behavior of each population can imply in risks of different magnitude in the determination of these events⁽⁴⁾.

Increase in obesity onset seems to be associated with a complex net of factors which are situated on genetic predisposition, environmental factors, related to life style, such as inadequate eating habits and sedentary behavior⁽⁴⁾, besides social and economical factors normally negatively associated with health and nutrition events. It is worth mentioning as well that puberty seems to be a crucial period to development of overweight and obesity^(5,6). In that period, the greatest sexual differentiation since fetal life and the fastest linear growth rate since the first years of life occur, besides stature and weight gain which will define such variables in adulthood⁽⁷⁾.

The information on this issue is scarce and even in the national and international publications on it there is need to deepen the knowledge about the factors associated with overweight in adolescents⁽¹⁻³⁾.

Considering that overweight and obesity present a multifactorial origin and occur to adolescents of different social status, indicating hence similar exposition, it is necessary to identify such exposition with the aim to decrease the onset and prevent sequelae not only during adolescence but also adulthood.

Therefore, the aim of the present study is to estimate the prevalence and identify the factors associated with overweight in adolescents aged between 10 and 18 years, of both sexes from Salvador, capital of Bahia state, and hence to contribute to the planning of effective actions to prevent this situation in adolescents as well as to promote public health and nutrition policies.

MATERIAL AND METHODS

Study outlining: a transversal study involving a sample representative of adolescents from the city of Salvador, originated from the investigation "Eating and nutritional profile of adolescents, adults and elderly from Salvador (PNAAI)", carried out in the period between October 2000 and September 2001.

Population, sample and sampling: for the sample calculation, obesity prevalence of 15.8% was adopted in schoolchildren from Salvador⁽⁹⁾, with significance level of 5% and error of 3% to detect the associations in question. The population is composed of adolescents⁽¹⁾ aged between 10 and 18 years from the city of Salvador, Bahia. Cluster random sampling was adopted in three stages: the census was the primary unit, the residence was the

secondary and the individuals, the tertiary. The final sample was composed of 426 adolescents, with 207 females and 219 males.

11 subdistricts were drawn out of the 21 which compose the city and 44 sectors (information zones) were drawn among the subdistricts, making use of maps and information provided by the City Hall of Salvador⁽⁸⁾. The sample was firstly made by drawing one street in each sector and identifying the first residence in this street. Having the first residence as a starting point, the interval of five was adopted for the systematic search of the remaining ones; considering those situated to the right and to the left of each street.

Approximately 20 residences in each census sector, randomly distributed in the city, were visited. In case of more than one adolescent in the same residence, one of them was drawn to participate in the study. In case the adolescent was not in the residence at the time of the interview, a new visit was scheduled, with up to two new visits being set; in case these trials were not successful, this adolescent would be replaced by another one at the same age group, sex and same census sector in a residence not visited. At that stage of the sample collection, substitution was not allowed. Exclusion criteria were: pregnancy, nursing females until the fourth month, physical and mental disabled, and individuals with endocrine disorders and/or any morbid process in which local or general hydric retention was identified.

Data collection: The information concerning the socioeconomical characteristics of the family and of the health aspects of the adolescents was obtained from structured questionnaires, filled out by interviewers trained for this aim. Weight and height anthropometric measurements were performed by trained evaluators according to recommendations by Lohman *et al.*⁽¹⁰⁾.

The system proposed by Conde and Monteiro⁽¹¹⁾, which is based on the body mass index (BMI) values of the Brazilian population from two to 19 years of age and developed from the data collected in the National Research on Health and Nutrition (PNSN) in the years of 1989 was used for the anthropometrical classification. overweight is a category which comprises individuals with overweight and obesity.

The maturational development stage of breasts (girls) and genital organs and pubic pilosity (boys) was assessed from self-referred information using the charts developed by Tanner and validated to Brazilian adolescents⁽¹²⁾. Sexual maturation was classified based on decimal age tertiles for each of the five stages of sexual maturation, in each sex⁽¹³⁾. Thus, for each sexual maturation stage, the individuals were distributed according to age and classified as follows: 1) individuals with early sexual maturation, those who were in the first tertile; 2) individuals with late sexual maturation, those who were in the third tertile; and reference group (normal maturation), those who were in the second tertile⁽¹³⁾. A loss of eight male (3.6%) and five female individuals was observed (2.4%) for the self-evaluation of sexual maturation. The losses occurred due to the refusal of the participants at the moment of sexual maturation evaluation during the study.

Physical activity was assessed through the record of physical activity, adapted to Brazilian adolescents⁽¹⁴⁾. Level of physical activity was classified considering active and insufficient active the individuals who performed, respectively, more than 300 weekly minutes of moderate physical activities⁽¹⁵⁾.

The information concerning food consumption is originated from the eating frequency inquiry, which classifies the daily, weekly, monthly consumption besides absence of consumption in the period. This information originated a pondered score, based on the methodology proposed by Fornés *et al.*⁽¹⁶⁾. This score was subsequently converted in tertile. For this study, only the protective consumption of the ponderal gain of the group of legumes, fruit and vegetables was investigated, which corresponds to the third tertile of the pondered score. Consumption in the first and second tertiles was classified as risky.

Age was calculated by the interval between the birthdate and the date of the interview; and was categorized in lower or equal to 14 years of age (protective).

Race was determined by the interviewer according to the skin complexion and physical attributes of the evaluatees, after training for application of the methodology proposed by Azevedo⁽¹⁷⁾, which considers the physical characteristics as type of hair and nose, skin color and lip thickness. Thus, the individuals were classified in white, clear mulatto, medium mulattos, dark mulattos and black.

The exploratory model of analysis was built having as referents for the dichotomy exposition variables, age \leq 14 years; sex = male; physical activity = active; food consumption in the third tertile of the score = protective consumption. Concerning sexual maturation and race, many drawings were created (*dumy*), having, respectively, normal sexual maturation and white race as referents. For the closing (overweight), the individuals with overweight were considered a risk group and the eutrophic individuals (normal) added to the individuals with low weight were considered the referents.

This research was approved by the Ethics Committee of the Professor Edgar Santos Hospital of the Clinics Hospital of the Federal University of Bahia and had free and clarified consent signed by the parents or legal tutors allowing the participation of the adolescents in the study.

STATISTICS ANALYSIS

Descriptive analysis of the variables in the study was carried out through the frequencies and percentages for those categorized and means (\pm standard deviation) for the continuous variables. The explanatory analysis of the associations was performed by the Poisson regression, according to recommendation by Barros and Hirakata⁽¹⁸⁾, presenting the raw and adjusted prevalence ratios (PR) and their respective confidence intervals at 95% (IC95%) for the investigated associations. The statistical package STATA, version 9.1 was used for the analyses.

RESULTS

Table 1 presents the characteristics of the 426 adolescents who compose the sample of the study. The age group 14-18 years of age was the most prevalent. 219 boys (51.4%) and 207 girls (48.6%) were assessed. Prevalence of overweight was of 14.3%. Lower proportion of the black race compared to the white, light, medium and dark mulatto races was observed. Additionally, it was observed that the insufficient active classification reached 65.0% of the adolescents.

Figure 1 presents the graphic comparison of the prevalence of overweight in adolescents in this study in some cities in the

Table 1. Characterization of demographic, anthropometric and behavior variables of adolescents from 10 to 18 years of age from the city of Salvador, Bahia (2000).

Variables	n	%
Age		
≤ 14 years	171	40.1
> 14 years	255	59.9
Sex		
Male	219	51.4
Female	207	48.6
Race		
White	76	17.8
Clear mulatto	129	30.3
Medium mulatto	115	27.0
Dark mulatto	62	14.6
Black	44	10.3
Sexual maturation*		
Normal maturation	142	34.0
Early maturation	138	33.0
Late maturation	138	33.0
Insufficient active		
Active	149	35.0
Insufficient active	277	65.0
Food consumption		
Protective	141	33.1
Non-protective	285	66.9
Anthropometric status		
Low weight	24	5.6
Normal/eutrophy	341	80.1
Overweight	55	12.9
Obesity	6	1.4
	Mean	± SD
Age (years)	14.8	2.4
Weight (kg)	50.3	12.1
Height (cm)	160.4	11.2
BMI (kg/m ²)	19.5	3.2
Sum SF (mm)	22.7	9.1
Leisure and sport activities (min/week)	360.2	497.4
Fruit and vegetables consumption score	0.24	0.12

*Loss of eight male individuals (3.6%) and five female individuals (2.4%).

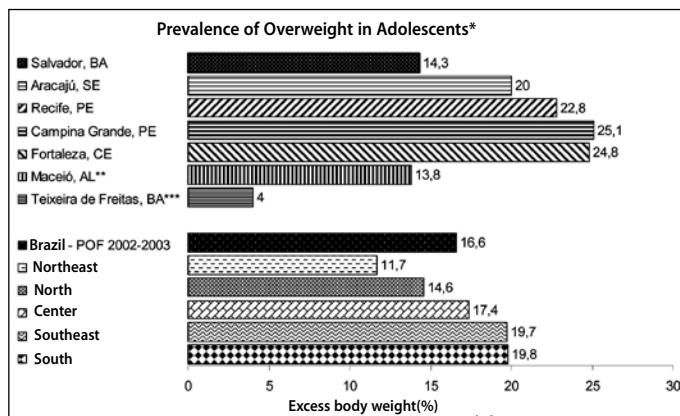


Figure 1. Comparison of the prevalence of overweight in adolescents from cities of the Northeast region and prevalence in Brazil and regions, according to data from the Research on Family Budget (POF) of 2002-2003.

*Overweight = overweight + obesity. **Overweight = risk of overweight + overweight

***Used the BMI and tricipitaltricipital and subscapular skinfolds to classify the anthropometric status. The remaining studies used only the BMI.

Northeast, as well as data from Brazil and remaining regions of the country.

Table 2 presents the prevalence ratio (PR) of the raw association between the exposure variables (age, sex, race, sexual maturation, physical activity and food consumption) and the closing (overweight). It was estimated that insufficient active individuals present two times more overweight, compared to the active individuals (PR = 2.0, IC95% = 1.08-3.7), being this association statistically significant. The remaining investigated associations were not statistically significant.

Table 3 presents the estimations of the prevalence ratios and IC95% of the adjusted associations, resulting from the multivariate analysis (Poisson regression). Early sexual maturation (PR_{adjusted} = 2.05, IC95% = 1.07-3.92) and the physical activity status considered "insufficient active" (PR_{adjusted} = 1.85, IC95% = 1.01-3.41) presented statistically significant residual contribution in the explanation for the overweight, in the presence of the remaining variables of the study.

Thus, the final model was composed of the variables: age of the adolescent, sexual maturation and physical activity, which have contributed to the higher prevalence ratios in the estimation of overweight. It was estimated that early sexual maturation (PR_{adjusted} = 2.12, IC95% = 1.10-4.05) and insufficient levels of physical activity (PR_{adjusted} = 1.85, IC95% = 1.01-3.41), adjusted by age (PR_{adjusted} = 1.77, IC95% = 0.97-3.24), are independently associated to the onset of overweight.

Table 2. Prevalence ratios of raw association between exposition and closing variables. Adolescents from the city of Salvador, Bahia, 2000.

Variables	n	Prevalence of Overweight (%)	PR	IC95%
Age				
≤ 14 years	171	12.9	1.0	-
> 14 years	255	15.3	1.19	0.70 - 2.0
Sex				
Male	219	16.0	1.0	-
Female	207	12.6	0.78	0.47 - 1.30
Race				
White	76	17.1	1.0	-
Clear mulatto	129	10.1	0.54	0.27 - 1.27
Medium mulatto	115	20.0	1.21	0.59 - 2.30
Dark mulatto	62	11.3	0.62	0.26 - 1.65
Black	44	11.4	0.62	0.24 - 1.86
Sexual maturation				
Normal maturation	138	12.3	1.0	-
Early maturation	137	20.4	1.62	0.83 - 2.71
Late maturation	138	10.1	0.81	0.38 - 1.54
Insufficient active				
Active	149	8.7	1.0	-
Insufficient active	277	17.3	2.0	1.08 - 3.66
Food consumption				
Protective	141	14.2	1.0	-
Non-protective	285	14.4	1.01	0.59 - 1.73

PR = prevalence ratio; IC95% = confidence interval at 95%.

Table 3. Prevalence ratios of the associations adjusted between the exposition and closing variables in adolescents aged between 10 and 18 years from the city of Salvador, Bahia, 2000.

Variables	Model 1		Final Model	
	PR	RI5%	PR	IC95%
Age				
≤ 14 years	1.0	–	1.0	–
> 14 years	1.76	0.96-3.21	1.77	0.97-3.24
Sex				
Male	1.0	–	–	–
Female	0.84	0.50-1.41	–	–
Race				
White	1.0	–	–	–
Clear mulatto	0.53	0.24-1.17	–	–
Medium mulatto	1.10	0.55-2.19	–	–
Dark mulatto	0.65	0.26-1.63	–	–
Black	0.64	0.23-1.81	–	–
Sexual maturation				
Normal maturation	1.0	–	1.0	–
Early maturation	2.05	1.07-3.92	2.12	1.10-4.05
Late maturation	0.75	0.37-1.54	0.75	0.37-1.54
Insufficient active				
Active	1.0	–	1.0	–
Insufficient active	1.78	0.95-3.30	1.85	1.01-3.41
Food consumption				
Protective	1.0	–	–	–
Non-protective	1.0	0.59-1.73	–	–

PR = prevalence ratio; IC95% = confidence interval at 95%.

DISCUSSION

Prevalence of overweight in adolescents of both sexes from 10 to 18 years of age from Salvador was of 14.3%. The insufficient level of physical activity and early sexual maturation were associated with the overweight in this population. The adolescents from the city of Teixeira de Freitas in Bahia⁽²⁴⁾ the prevalence of overweight was considerably lower (4.0%) than the one identified in the capital city of the same state.

Comparing to other capitals in the Northeast region, it is observed that the prevalence of overweight in adolescents from Salvador is higher than the ones identified in Aracaju (20%)⁽¹⁹⁾, Recife (22.8%)⁽²⁰⁾, Campina Grande (25.1%)⁽²¹⁾, Fortaleza (24.8%)⁽²²⁾, and slightly higher than the one recorded in Maceió (13.8%)⁽²³⁾, according to data presented in figure 1. Methodology similar to the one in this study was used in the Research on Family Budget (POF) in 2002-2003⁽²⁾, in adolescents aged between 10 and 19 years. It is observed that prevalence of overweight of this study is lower than the national score (16.6%), lower than the prevalence identified in the Southeast (19.7%), South (19.8%) and Central regions (17.4%). However, the prevalence in this study (14.3%) was similar to the one

identified to the North region (14.6%) and slightly higher than the one in the Northeast region (11.7%) (figure 1).

Having data of the adolescents examined by the POF 2002-2003⁽²⁾ as a starting point, it was corroborated that there was increase in overweight and obesity in Brazil, in all regions and economic strata of the population, especially in male adolescents. When data from three big national inquiries are compared (ENDEF, 1974-1975; PNSN, 1989; POF, 2002-2003), the prevalence of overweight in boys was of 3.9% in the first inquiry, it doubles from the first to the second one (8.3%) and doubles again from the second to the third one (17.9%)⁽²⁾. Overweight in girls increased in about 80% from the first to the second inquiry (from 7.5% to 13.8%) and increased in only about 10% from the second to the third one (from 13.8% to 15.4%)⁽²⁾.

Brazilian studies which approach the factors associated with overweight in adolescents are scarce and among these, the majority focuses on the Southeast and South regions of the country. Results from other national studies also indicate significant association between insufficient levels of physical activity and overweight in adolescents⁽²⁵⁻²⁷⁾. This evidence corroborates the recommendations by the Global Strategy in Eating, Physical Activity and Health, established by the World Health Organization in the year of 2004⁽²⁸⁾, which are based on practice of healthy eating habits and life style. These recommendations, which Brazil follows, hold these countries responsible for including actions which promote healthy habits in their public policies, giving priority to those related to a healthy diet, especially aimed at higher consumption of fruit, other vegetables, fibers and whole cereals as well as adoption of a healthier life style and more active physical activity⁽²⁸⁾.

Results of other studies also indicate the early sexual maturation plays an important role in the onset of overweight. There is evidence that girls early matured present higher prevalence of overweight and obesity^(29,30) than those who mature in the physiologically suitable time. Few investigations have studied such association in boys and even though still report controversial results^(13,30).

In this study, statistically significant association between race and socioeconomical status (data not presented) was observed, indicating higher proportions of mulattos and black individuals in the poor strata. According to the POF 2002-2003⁽²⁾ and further studies^(9,20,22), Brazilian youngsters from social classes considered low income, present lower prevalence of overweight. Nevertheless, it seems that due to the improvement in life conditions as well as easier access to food, not always of suitable quality, the poor population has presented overweight prevalence similar to or higher than the high class population, as was reported by Farias Júnior and Lopes⁽³¹⁾, to adolescents from the city of Florianópolis (SC). In this study, it was observed that clear mulatto individuals presented prevalence 20% higher of overweight than white individuals. However, further studies which adopt bolder analytical approaches and prospective study outlining in order to deepen these associations are needed.

The results of this study added to the ones from studies on

the macroregions of the country corroborate the hypothesis that low levels of physical activity joined with other etiological factors, contribute to overweight in young subjects. It is necessary that public policies which prevent and combat overweight improve availability, access and stimulate effective practice of physical activity at a population level. These actions should be early performed either in schools or other collective spaces in

order to break the cycle which associates obesity in childhood and many morbidities in adulthood.

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