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Prevalence and factors associated to overweight and obesity in adolescents

ABSTRACT

OBJECTIVE: To assess the prevalence and factors associated to overweight and obesity in urban area adolescents.

METHODS: A cross-sectional population-based study was carried out in the municipality of Pelotas, Southern Brazil, between 2001 and 2002. Adolescents between 15 and 18 years old were weighed, measured and asked to complete a self-administered questionnaire. Of 90 areas drawn, 86 dwellings were visited in each area, comprising a total of 960 adolescents interviewed. Overweight and obesity prevalences were defined based on the body mass index, according to cutoff values and adjusted to age and sex. Multivariate analysis with Poisson regression was performed using a hierarchical model of variables associated to overweight and obesity.

RESULTS: Overweight and obesity prevalences were 20.9% and 5% respectively. There was found an inverse relationship between obesity and age and schooling. An association of overweight and obesity with reporting parents' obesity (p=0.03) and adolescents' sexual maturation (p=0.01) was seen. Dieting and skipping meals were associated to obesity with a risk of 3.98 (95% CI: 1.83-8.67) and 2.54 (95% CI: 1.22-5.29) respectively.

CONCLUSIONS: Overweight and obesity prevalences in the area studied are of concern despite adolescents' behaviors to prevent to obesity. There is a need to implement more effective campaigns to provide better guidance to adolescents.

KEYWORDS: Teen health. Prevalence. Obesity, epidemiology. Risk factors. Cross-sectional studies.

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INTRODUCTION

Obesity is no longer an isolated problem but has now become a significant public health concern. Its prevalence has increased over the last decades, especially in developed countries[9] but a similar trend has been seen in developing countries, like Brazil. The highest prevalences of obesity have been seen in Southern Brazil, which are similar or even higher than those found in developed countries.[5]

The health impact of obesity has been described in several studies. Excess fat in adult life has been associated to higher rates of Diabetes Mellitus, high blood pressure,* high levels of triglycerides and high cholesterol.[4] In children and adolescents, obesity has been associated to early development of cardiovascular diseases,[15] type 2 Diabetes Mellitus, and psychological dysfunction,[8] besides impairing posture and causing musculoskeletal abnormalities and bringing about social and economic disadvantages during adult life.[6]

Recent studies have showed that children and adolescents with high body mass index (BMI) are also more likely to be overweight or obese by the age of 35 and this risk significantly increases as these children grow older. Adolescents who are obese at the age of 18 are 0.7 times more likely to be obese during their adulthood than those adolescents with normal BMI.[7]

Obesity during adolescence has also increased in recent years reaching a prevalence of 10.6% among girls and 4.8% among boys. In the Southern region, prevalence rates have reached 13.9%.[12]

Several factors are likely to be associated to this condition. Although high body weight is the result of an imbalance between energy intake and energy expenditure, defining it has been a challenge as it varies according to demographic, social and economic, genetic, psychological, environmental, and individual factors.[1,3,8,12]

Given the increasing prevalence of obesity prevalence in Brazilian population and because it is a risk factor for several major diseases, the present study aimed at assessing the prevalence and factors associated to overweight and obesity among adolescents living in an urban area.

METHODS

This study is part of the research project "Health be-

haviors among adolescents living in the urban area of Pelotas". Other factors, such as physical inactivity, have been addressed in another published study.[13] As this is part of a larger research project, the estimates of sample size were based on multiple objectives. At 95% confidence and five-point significance level, estimates of sample size were obtained to assess multiple outcomes such as obesity, physical inactivity, common mental conditions, and smoking, among others. Based on the estimate of 17% smokers in the age group 15 to 18 years, a sample size of 1,000 adolescents was obtained.

Ninety out of 448 census tracks were systematically drawn in the city of Pelotas, Southern Brazil. For each census track, a street corner was drawn as a starting point and, from there, 86 households were visited consecutively, totaling 7,740 households. In each household visited, all residents aged between 15 and 18 years old were interviewed after their parents or caretaker have given their written consent.

Data collection was carried out from December 2001 to April 2002. Study interviewers were university students trained in administering the questionnaire, answering questions and standardizing anthropometric measures.

Of 1,039 adolescents eligible, 79 were excluded due to their parents/caretaker's refusal or their own refusal to participate in the study or either because they were not found at home after three visits, a loss of 7.6%. Thus, 960 adolescents participated in the study comprising a representative sample of those living in the urban area of Pelotas.

Data was collected through weight and height measures and a self-administered questionnaire. A 0.5kg precision scale was used for weight measures of subjects wearing light clothes and no shoes. Height was measured using a 0.1cm precision anthropometric ruler. Weight and height measures were collected by interviewers to avoid any possible measurement bias.

The following variables were assessed in the questionnaire: gender (male and female); age (complete years); schooling (complete years); mother's and father's schooling (complete years); social and economic status (social class A, B, C, D, and E according to the Associação Brasileira de Institutos de Pesquisa de Mercado (ABIPEME - Brazilian Association of Institutes for Market Research); paid job in the month prior to the interview (yes or no); description of their parents' physical look, assessed through adolescents'

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*Piccini RX. Hipertensão arterial sistêmica em Pelotas, RS: prevalência, fatores de risco e manejo [dissertação de mestrado]. Pelotas: Universidade Federal de Pelotas; 1993.

perception of their mother's and father's obese physical look; sexual maturation assessed through age at menarche or first ejaculation; physical activity assessed through physical activity at school or out of school (yes or no); alcohol and tobacco use in the month prior to the interview; dieting (yes or no) and skipping meals; average daily time watching TV; and minor psychological disorders assessed through Self-Report Questionnaire (SRQ 20).[10]

Obesity was defined by the BMI, dividing body mass in kilograms by squared height in meters. Table 1 shows the cutoff values used to determine overweight and obesity according to the International Obesity Task Force (IOTF), proposed by Cole et al[2] (2000).

For quality control, supervisors confirmed information obtained in 30% of households visited and questionnaires were coded right after the interviews.

Data were doubled entered in Epi Info software program. Univariate analysis with variable frequencies and distribution was performed. Proportion comparison was carried out using the Chi-square test and Yates' correlation test. Multivariate analysis was conducted using Poisson's regression with robust variance adjusting and controlling for design effect since the study was based on systematic sampling. The hierarchical model included demographic and socioeconomic variables in the first level; description of parents' physical look in the second level; adolescent's sexual maturation in the third level; and

Table 1 - Overweight and obesity cutoff values adjusted by age and gender. Southern Brazil, 2001-2002.*

Age (years)	BMI for overweight		BMI for obesity	
	Boys	Girls	Boys	Girls
15	≥23.29	≥23.94	≥28.3	≥29.11
16	≥23.9	≥24.37	≥28.88	≥29.43
17	≥24.46	≥24.7	≥29.41	≥29.69
18	≥25	≥25	≥30	≥30

*Based on cutoff values proposed by Cole et al.[2]

psychobehavioral variables in the fourth level. Variables with significance level equal to or below 0.20 were included in the model.

RESULTS

The prevalence of obesity in the studied population was 5.0% and the prevalence of overweight was 20.9%.

About six in every 10 adolescents had nine or more complete years of schooling. As for their socioeconomic status, most belonged to class C. Table 2 shows gender was not found to be associated to overweight and obesity. Adolescents by the age of 18 had lower prevalence of obesity (p<0.05). Adolescent's schooling was associated to obesity as higher obesity rates were seen in those with lower schooling (p<0.05). On the other hand, overweight was more commonly seen among those whose mothers had nine years or more of schooling (p<0.05) as well as in those with higher socioeconomic status (Table 2).

In regard to adolescents' description of their parents'

Table 2 - Distribution of overweight and obesity prevalences according to social and demographic factors. Southern Brazil, 2001-2002.

Variable	Category	Overweight (%)	Obesity (%)	N
Gender		p=0.7	p=0.8	
	Male	21.3	5.1	463
	Female	20.5	4.8	497
Age		p=0.3	p=0.04	
	15	23.7	8.3	227
	16	22.8	4.8	271
	17	18.1	2.7	221
	18	18.6	4.1	241
Schooling (complete years)		p=0.9	p=0.02	
	0 to 4	19.2	5.7	52
	5 to 8	21.0	7.4	351
	9 or more	21.0	3.4	557
Mother's schooling (complete years)		p=0.04	p=0.9	
	0 to 4	17.6	5.0	198
	5 to 8	18.9	5.2	416
	9 or more	25.2	4.6	345
Father's schooling (complete years)		p=0.4	p=0.4	
	0 to 4	19.4	5.6	211
	5 to 8	19.9	5.6	406
	9 or more	23.0	3.7	343
Social class		p=0.06	p=0.8	
	A or B	24.8	4.9	346
	C	19.6	5.4	366
	D or E	17.3	4.4	248
Paid job		p=0.8	p=0.1	
	Yes	20.3	6.9	202
	No	21.1	4.4	758
Total		20.9	5.0	960

Table 3 - Distribution of overweight and obesity prevalences according to parents' profile and adolescents' sexual maturation. Southern Brazil, 2001-2002.

Variable	Category	Overweight (%)	Obesity (%)	N
Perception of mother's obesity		p=0.09	p=0.3	
	Yes	25.5	6.5	184
	No	19.9	4.7	762
Perception of father's obesity		p=0.03	p=0.005	
	Yes	26.6	8.8	203
	No	19.5	3.9	711
Obese parents		p=0.03	p=0.06	
	None	18.7	3.8	592
	One	24.1	6.7	253
	Both	30.1	9.5	63
	Total	21.0	5.0	960
Sexual maturation		p=0.01	p=0.8	
	<11 years	26.7	5.3	206
	12 to 13 years	20.7	5.0	516
	14 to 18 years	14.8	4.0	175
	Total	20.9	4.9	897
Boys' sexual maturation (first ejaculation)		p=0.2	p=0.7	
	<11 years	27.7	4.1	72
	12 to 13 years	21.6	5.5	236
	14 to 18 years	17.9	3.7	106
	Total	21.7	4.8	414
Girls' sexual maturation (menarche)		p=0.02	p=0.8	
	<11 years	26.1	5.9	134
	12 to 13 years	20.0	4.6	280
	14 to 18 years	10.1	4.3	69
	Total	20.3	5.0	483

physical look, children of obese fathers had higher prevalences of overweight and obesity (p<0.05) when compared to normal fathers but this association was not seen for mother's physical look. Adolescents whose none of their parents were obese showed lower prevalence of overweight than those who described one or both parents as obese (p<0.05). An association of overweight with sexual maturation age was seen; those who had matured later showed lower overweight than those who had matured earlier (p=0.01). This difference was significant only among girls (p=0.02) (Table 3).

Dieting was strongly associated with overweight and obesity. Those reporting dieting had 40.5% and 16.2% prevalence of overweight and obesity respectively (p<0.01). Those who reported skipping meals also had higher prevalences of overweight and obesity (p<0.01). Tobacco and alcohol use was not found to be associated to overweight and obesity, as well as physical activity at school. However, higher prevalence of physical activity out of school was seen among those with higher overweight (p<0.05). Time spent watching TV and minor psychiatric disorders

Table 4 - Distribution of overweight and obesity prevalences according to psychobehavioral factors. Southern Brazil, 2001-2002.

Variable	Category	Overweight (%)	Obesity (%)	N
Dieting		p<0.01	p<0.01	
	Yes	40.5	16.2	111
	No	18.4	3.5	844
Skipping meals		p<0.01	p=0.01	
	Yes	27.6	7.8	434
	No	15.1	2.6	521
Alcohol use (in the month prior to the study)		p=0.3	p=0.9	
	Yes	22.4	4.8	410
	No	19.7	5.0	538
Tobacco use (in the month prior to the study)		p=0.5	p=0.2	
	Yes	19.1	3.1	157
	No	21.3	5.3	803
Physical activity at school		p=0.7	p=0.07	
	Yes	20.8	4.6	319
	No	20.6	4.7	601
Physical activity outside school		p=0.04	p=0.5	
	Yes	23.9	5.5	418
	No	18.6	4.6	542
Watching TV (daily hours)		p=0.1	p=0.4	
	<2	22.5	5.3	244
	3 to 4	21.7	3.9	304
	5 to 7	22.9	6.1	244
	8 or more	14.2	4.7	168
Minor psychiatric disorders		p=0.8	p=0.4	
	Yes	21.6	5.4	277
	No	20.9	4.3	663
Total		20.9	5.0	960

Table 5 - Final hierarchical model of overweight and obesity in the multivariate analysis. Southern Brazil, 2001-2002.

Levels of hierarchical model	Variable	Category	Overweight PR(CI 95%)	Obesity PR(CI 95%)
First level	Age	15	1.16 (0.78-1.17)	1.66 (0.79-3.51)
		16	1.23 (0.85-1.79)	1.07 (0.47-2.43)
		17	0.99 (0.68-1.44)	0.71 (0.27-1.86)
		18	Reference	Reference
	Adolexcent's schooling	0 to 4		2.30 (0.82-6.44)
		5 to 8		2.53 (1.32-4.85)
		9 or more		Reference
	Mother's schooling	0 to 4	0.92 (0.63-1.32)	
		5 to 8	0.87 (0.65-1.17)	
		9 or more	Reference	
Second level	Obese parents	None	Reference	Reference
		One	1.26 (0.97-1.62)	1.97 (1.14-3.40)
		Both	1.44 (0.91-2.28)	2.39 (1.00-5.71)
Third level	Sexual maturation	<11 years	1.38 (0.86-0.20)	
		12 to 13 years	1.19 (0.81-1.17)	
		14 to 18 years	Reference	
Fourth level	Dieting	Yes	1.72 (1.24-2.38)	3.98 (1.83-8.67)
		No	Reference	Reference
	Skipping meals	Yes	1.69 (1.29-2.21)	2.54 (1.22-5.29)
		No	Reference	Reference
	Phisical activity outside school	Yes	1.42 (1.11-1.83)	
		No	Reference	
	Watching TV (daily hours)	<2	Reference	
		3 to 4	0.87 (0.60-1.26)	
		5 to 7	0.88 (0.62-1.25)	
		>8	0.55(0.32-0.94)	
	Tobacco use	Yes		0.45 (0.17-1.18)
		No		Reference
	Minor psychiatric disorders	Yes		0.63 (0.33-1.19)
		No		Reference

PR: Prevalence ratio

were not found to be associated to overweight and obesity (Table 4).

Multivariate analysis for overweight showed that, even after adjusting for adolescent's age, mother's schooling, obese parents, and sexual maturation, those who reported dieting had a higher overweight prevalence ratio (PR) of 1.72 (95% CI: 1.24-2.38). Other variables associated to overweight were: skipping meals (PR=1.69; 95% CI: 1.29-2.21), and physical activity outside school were (PR=1.42; 95% CI: 1.11-1.83) (Table 5).

In regard to obesity, after adjusting for confounders in the multivariate analysis, those who had five to eight years of schooling were 2.53 (95% CI 1.32-4.85) more likely to be obese when compared to those who had completed high school or more. Having obese parents was also associated to obesity: PR of 1.97 (95% CI: 1.14-3.40) when one parent was obese and PR of 2.39 (95% CI: 1.00-5.71) when both parents were obese. Dieting and skipping meals were also found to be associated to obesity: PR of 3.98 (95% CI: 1.83-8.67) and PR of 2.54 (95% CI: 1.22-5.29), respectively (Table 5).

DISCUSSION

Overweight and obesity prevalences of 20.9% and 5%, respectively, are similar to the findings of another study in Pelotas by Monteiro et al[11] (2000) who found 24.5% of overweight and 9% of obesity. These

slightly different results can be explained by the fact that, at that time, Monteiro et al[11] were investigating the best criterion to assess BMI cutoff values and for not using the same cutoffs adjusted by age and gender as proposed by Cole et al[2] (2000). The findings of the present study are higher than those found by Alves et al[1] (2000) who described 14% prevalence of overweight and obesity. This difference could be explained by the fact that Alves et al results were underestimated as their study sample comprised military men only. Neutzling et al[12] (2000), in their population-based study similar to the present study, found 7.7% overweight and obesity. However, it should be stressed the age group range of this study was 10 to 19 years, which reduces the specificity of the study population and could explain the lower prevalence found.

As for adolescent's schooling, it was seen a trend towards a significant negative association: those with lower schooling were more likely to be overweight and obese, even after adjusting for age in the multivariate analysis, which corroborates Piccini's[14] findings.

Familiar transmission of obesity is a well-known event, probably due to either genetic or life style factors.[15] One limitation of the present study was not to include an assessment of nutritional diet of adolescents and their families, preventing further inferences on their life style. An alternative option was to assess adolescents' description of their parents' looks, which

proved to be associated to their own obesity. Those who perceived their parents as obese were 2.39 times more likely to be obese, even after controlling for age and schooling.

The younger the adolescent's sexual maturation, the higher their prevalence of overweight and obesity, especially for girls. This association was seen in the bivariate analysis but was not there after controlling for potential confounders. The lack of consistency of these findings could suggest that the selected criterion of sexual maturation was not able to fully assess this variable, thus further investigation is needed.

Adolescents with minor psychiatric disorders were less likely to be obese in the multivariate analysis.

A strong association with overweight and obesity was seen among those reporting dieting, skipping meals, and physical activity outside school. This evidences

a limitation of this study design as it did not allow to determining a causal association but only to explore an association between a particular outcome and their variables without assessing risk and protection factors. This association could be explained by assuming that overweight and obese adolescents are concerned about their looks and health and therefore engage in preventive behaviors. Though it is not possible to verify that, these behaviors may not be adequate. Further studies are needed to assess these behaviors' significance and characteristics as, if not adequately controlled, they could aggravate these adolescents' condition.

The findings of the present study evidenced concerning high overweight and obesity prevalences in adolescents. There is a need for more effective public health campaigns that would provide better guidance to adolescents and prevent high obesity rates similar to those seen in developed countries.

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