

Overweight/obesity in adolescents from Santa Maria, Brazil: prevalence and associated factors

Sobrepeso/obesidade em adolescentes de Santa Maria-RS: prevalência e fatores associados

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Abstract – Obesity is a worldwide epidemic that keeps on rising among children and adolescents from several countries. The purpose of this study was to verify the prevalence of overweight/obesity and its correlates in adolescents enrolled in the 1st year of high school in the municipality of Santa Maria, state of Rio Grande do Sul, Brazil. A cross-sectional, school-based, study was performed during the second semester of 2008. Adolescents aged 14 to 18 years old responded to a questionnaire and had their body mass and stature measured. The prevalence of overweight and obesity was defined according to the Brazilian reference for body mass index in adolescents. Correlates of overweight/obesity were determined by Poisson regression. The sample included 424 adolescents (54.7% boys) with mean age of 15.7 years (± 0.89). The prevalence of overweight/obesity was 23.8% (95%CI; 19.75–27.85). After adjusting for potential confounding factors, the following variables were associated with overweight/obesity: sex (PR=2.45; 95%CI 1.63–3.68), having been dismissed from physical education classes (PR=2.73; 95%CI 1.88–3.95) and having a good relationship with classmates (PR=1.57; 95%CI 1.12–2.19). It was concluded that the prevalence of overweight/obesity in this sample was high, prompting the need for preventive programs of excessive weight in this age group.

Key words: Adolescent; Cross-sectional studies; Obesity; Overweight; Risk Factors.

Resumo – A obesidade é uma epidemia mundial e continua a aumentar entre crianças e adolescentes de diversos países. O estudo teve como objetivo verificar a prevalência e fatores associados ao sobrepeso/obesidade em adolescentes matriculados no 1º ano do ensino médio da cidade de Santa Maria-RS. Estudo transversal, de base escolar, realizado durante o segundo semestre letivo de 2008. Adolescentes de 14 a 18 anos responderam a um questionário e tiveram a massa corporal e a estatura mensuradas. As prevalências de sobrepeso e obesidade foram definidas de acordo com o referencial do índice de massa corporal para jovens brasileiros. Os fatores associados ao sobrepeso/obesidade foram determinados por regressão de Poisson. A amostra compreendeu 424 adolescentes (54,7% meninos), com média de idade de 15,7 anos ($\pm 0,89$). A prevalência de sobrepeso/obesidade foi de 23,8% (IC95% 19,75–27,85). Estiveram associadas a esse desfecho, após ajuste para possíveis fatores de confusão, as variáveis: sexo masculino (RP=2,45; IC95% 1,63–3,68), ser dispensado das aulas de educação física (RP=2,73; IC95% 1,88–3,95) e ter uma boa relação com os colegas (RP=1,57; IC95% 1,12–2,19). Pode-se concluir que a prevalência de sobrepeso/obesidade na amostra estudada foi elevada, alertando para a necessidade de programas de prevenção ao excesso de peso nessa faixa etária.

Palavras-chave: Adolescente; Estudos transversais; Fatores de risco; Sobrepeso; Obesidade.

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INTRODUCTION

According to the World Health Organization¹, excess weight is responsible for 2.8 million deaths worldwide. This same entity projects that by 2015, one and a half billion people will be overweight¹. This fact will, possibly, trigger major impacts on the quality of life of the population and in public spending on health.

Estimates indicate that costs associated with obesity comprise between 2% and 8% of annual health costs in the world², values that should reach, in the United States alone, between 16% and 18% of annual health care costs in 2030³. In Brazil, costs with hospitalizations in 2001 related to excess weight exceeded 30 million dollars⁴.

Moreover, there is an increasing trend in the prevalence of overweight/obesity in young people. In the last four decades, the prevalence of overweight among Brazilian adolescents increased from 4% in 1974⁵, to 30% in 2010⁶. In the United States, during the same period, prevalence of overweight/obesity among adolescents increased from 17%⁵ to 50%⁷.

These data become more worrying when prospective studies are considered, which indicate that many children and adolescents who are overweight tend to remain in this state in adult life⁸. This situation may lead to the development of several health problems, especially related to cardiovascular and metabolic health⁹.

It is also known that the occurrence of overweight/obesity may be associated with socioeconomic, demographic, environmental and behavioral factors¹⁰, but the external validity of findings on these variables is limited. Thus, the need to study the characteristics of adolescents regarding the occurrence of overweight/obesity is notable, due to the higher rates of prevention strategies verified in this age group¹¹.

Therefore, for effective intervention programs to be developed, it is essential to know the population and to identify risk groups regarding overweight/obesity. Thus, the purpose of this study was to verify prevalence and factors associated with overweight/obesity in school adolescents attending the 1st year of high school in the municipality of Santa Maria, state of Rio Grande do Sul, Brazil.

METHODS

Population and sample

Santa Maria is located on the central region of the state of Rio Grande do Sul and has a population of approximately, 250,000 inhabitants. The municipality stands out for being the most populated of the region and it is considered as a center of education and services. In the municipality, in 2008, there were 28 high schools (15 state, 10 private and 3 federal).

The present cross-sectional study was conducted during the second school semester of 2008, and surveyed students aged between 14 and 18 years, of both sexes, enrolled in the 1st year of high school in the day shift,

from state, federal and private schools. To this end, we selected a representative sample of this population, resulting in 11 schools (six state, four private and one federal school).

Schools were stratified by type of school (state, federal and private) and number of students, and then selected by simple random sampling. The number of selected groups (n=22) respected the proportion of students in each type of school and the size of each selected school. In addition, schools were selected in all regions of the municipality.

The sample size was determined based on an estimate that the prevalence of overweight/obesity, in this age group, would be of 25%¹². The number of students enrolled in the 1st year of high school was requested to each school, resulting in 2,878 students attending the day shift, and out of these, 1,825 enrolled in state schools, 260 in federal schools and 793 in private schools. In the night shift, there were 638 students enrolled in the 1st year of regular high school, which were not included in the sample, once most of them were aged over 18 years.

The confidence level established was of 95% and the margin of error of 4 percentage points, with an estimate sample of 390 students. To these, 10% were added, due to potential losses and refusals.

Instruments and procedures

Data collection consisted of anthropometric measurements and a questionnaire. To measure body mass, we used a *Plenna* digital scale (MEA-03140), with 0.1kg accuracy and 150kg capacity. To check height, a *Sanny* anthropometric ruler was used, with a length of 2m and 0.1cm accuracy, fixed on a wall, without a baseboard or any surface that could influence the measure. To perform both measures, we followed the recommendations of Marfell-Jones et al.¹³.

These measures were used to calculate Body Mass Index (BMI), an expression that divides body weight by height squared. BMI values obtained were compared with the reference tables for classification of nutritional state of Brazilian adolescents proposed by Conde e Monteiro¹⁴. For purposes of analysis, individuals classified as overweight or obese were grouped in the same category (Overweight/Obesity). This variable was considered the outcome of the study.

With the questionnaire we obtained the following variables: sex, age, economic level, type of school, physical activity, sedentary behavior time, participation in physical education classes and relationship with classmates. To determine the economic levels, we used the Criterion Brazil 2008 (Critério Brasil)¹⁵, which takes into consideration the ownership of household assets, presence of housemaids and education of the head of the family. According to the obtained score, the adolescents were classified in classes varying from E (lower) to A (higher).

The level of physical activity was measured with the third part of the COMPAC¹⁶ questionnaire, which examines the practice of moderate to vigorous physical activities, in commuting activities and leisure activities

during a typical week. The adolescent that accumulated 300 minutes or more of these activities was considered active¹⁷.

Sedentary behavior was defined as the daily length of time spent watching television, using the computer or playing video games reported by the adolescent. Later, this variable was dichotomized as 4 hours per day (<4h/day or ≥4h/day)¹⁸.

Data Analysis

Description of data included: calculation of means, standard deviations, proportions and confidence intervals of 95% (95%CI). To analyze prevalence, according to the independent variables, we used the chi-square test with Yates correction for heterogeneity, or Chi-square for linear trend in ordinal exposures.

A Poisson regression model with robust variance was used for analysis of the associated factors. We elected this method because it presents measurements that are more accurate and easier to interpret compared to odds ratio¹⁹. Associations that presented p value <0.2 were maintained for the adjustment of possible confounding factors in the multiple analysis.

The variables in the model observed a two-level hierarchical modeling¹⁷. The first level was composed by sex, age, economic level and type of school, while the second encompassed physical activity, sedentary behavior, participation in physical education classes, and relationship with colleagues. The adjustment of the model was between the variables from the same or the previous level in the hierarchical model. All analyses were conducted in STATA 10. The significance level adopted was of 5%.

Ethical aspects

This study was approved by the Research Ethics Committee of the Universidade Federal de Santa Maria (CAAE 0121.0.243.000-08) and meets all standards for research including humans. All adolescents who participated in this study were authorized by their parents, through the signature of a consent form.

RESULTS

At the end of data collection, 424 adolescents were studied. Out of these, six presented low weight (1.4%) and 317 (74.8%) presented normal BMI. However, 101 adolescents had BMI above normal, 83 were classified as overweight, (19.6%; 95%CI 15.8%-23.4%) and 18 as obese (4.2%; 95%CI 2.3%-6.1%). When overweight or obese individuals were grouped in a same category, the prevalence encountered was of 23.8% (95%CI 19.8%-27.8%).

Table 1 presents the description of the sample and association between overweight/obesity according to the independent variables. Prevalence overweight/obesity was higher among boys when compared to girls (32.3% vs. 13.5%; p<0.001), and was the only socio-demographic variable to present significant association. Among the behavior variables, adolescents that re-

ported to spend 4 or more hours per day in sedentary behavior presented a prevalence of overweight/obesity higher than those who spent less time in this behavior (25.8% vs. 15.2%; $p=0.064$). Furthermore, prevalence of overweight/obesity was significantly higher among adolescents that reported not attending physical education classes (45% vs. 21.6%; $p=0.002$) and those who considered their relationship with classmates as good (29.6% vs. 18.5%; $p=0.011$).

Table 1. Sample description and prevalence of overweight/obesity in adolescents according to the independent variables searched, Santa Maria, state of Rio Grande do Sul, Brazil, 2008.

Variables	Sample description	Overweight/obesity	P value
	% (n)	% (n)	
Sex			<0.001*
Female	45.3 (192)	13.5 (26)	
Male	54.7 (232)	32.3 (75)	
Age (years)			0.519*
14 and 15	71.2 (302)	24.8 (75)	
16 to 18	28.8 (122)	21.3 (26)	
Economic Level			0.972**
A	17.2 (73)	24.7 (18)	
B	59.4 (252)	23.4 (59)	
C and D	23.4 (99)	24.2 (24)	
Type of school			0.742*
Public	75.0 (318)	23.3 (74)	
Private	25.0 (106)	25.5 (27)	
Physical education			0.002*
Attends	90.6 (384)	21.6 (83)	
Dismissed	9.4 (40)	45.0 (18)	
Physical activity			0.073*
<300min/week	32.6 (138)	18.1 (25)	
≥300min/week	67.4 (286)	26.6 (76)	
Sedentary behavior			0.064*
< 4h/day	18.6 (79)	15.2 (12)	
≥ 4h/day	81.4 (345)	25.8 (89)	
Relationship with classmates			0.011*
Good	47.9 (203)	29.6 (60)	
Bad	52.1 (221)	18.5 (41)	

* Chi-square test with Yates correction;

** Chi-square test for linear trend.

Table 2 presents the crude prevalence ratios and adjusted for the occurrence of overweight/obesity. Boys presented an approximately two and a half-fold higher risk of presenting overweight/obesity (PR=2.39; 95%CI 1.59-3.57) when compared to girls. This association remained significant after adjustment for possible confounding factors.

Additionally, being dismissed from physical education classes (PR=2.73; 95%CI 1.88-3.95) and having a good relationship with classmates (PR=1.57; 95%CI 1.12-2.19) were risk factors for overweight/obesity in the multivari-

ate analysis. The other independent variables did not present association with the outcome studied.

Table 2. Crude and adjusted prevalence ratios (PR) for overweight /obesity in adolescents according to independent variables studied. Santa Maria, state of Rio Grande do Sul, Brazil, 2008.

Variables	Crude Analysis	P Value	Adjusted Analysis	P Value
	PR (95%CI)		PR (95%CI)	
Sex ^a		<0.001*		<0.001*
Female	1.00		1.00	
Male	2.39 (1.59-3.57)		2.45 (1.63-3.68)	
Age (years) ^a		0.446*		0.205*
14 and 15	1.00		1.00	
16 to 18	0.86 (0.58-1.27)		0.77 (0.52-1.15)	
Economic level ^a		0.973**		0.634*
A	1.00		1.00	
B	0.95 (0.60-1.50)		0.96 (0.61-1.51)	
C and D	0.98 (0.58-1.67)		1.12 (0.66-1.89)	
Type of school ^a		0.643*		0.623*
Public	1.00		1.00	
Private	1.09 (0.75-1.60)		1.10 (0.76-1.58)	
Physical educa- tion ^b		<0.001*		<0.001*
Yes	1.00		1.00	
No	2.08 (1.41-3.08)		2.73 (1.88-3.95)	
Physical activity ^b		0.063*		0.206*
<300min/week	1.00		1.00	
≥300min/week	1.47 (0.98-2.20)		1.29 (0.87-1.91)	
Sedentary be- havior ^b		0.060*		0.144*
< 4h/day	1.00		1.00	
≥ 4h/day	1.70 (0.98-2.95)		1.45 (0.88-2.40)	
Relationship with Classmates ^b		0.009*		0.008*
Bad	1.00		1.00	
Good	1.59 (1.12-2.26)		1.57 (1.12-2.19)	

^aFirst level: variables adjusted among each other;

^bSecond level: variables adjusted by the first level and among each other;

* Wald test for heterogeneity; ** Wald Test for linear trend.

DISCUSSION

Approximately, one in four teenagers studied were classified as overweight/obesity. Being male, not attending physical education and having a good relationship with classmates were risk factors for overweight/obesity.

This study found the prevalence of overweight was 19.6% and the prevalence of obesity was 4.2%, similar to the 20.9% for overweight and 5% for obesity reported by Terres et al.¹², who investigated adolescents aged between 15 and 18 years in the municipality of Pelotas-RS.

However, evidence shows that the prevalence of overweight/obesity in this age group may vary a lot according to the place where the study was performed. For instance, in Mexican-American adolescents the occurrence of overweight/obesity is of 63.8%²⁰, while in Canadian adolescents, 42.8%²¹ and in Turkish adolescents, 16.5%²².

Even in Brazil, when different regions of the country are considered, the differences in the prevalence of overweight/obesity may be significant. A recent study performed in the capitals of all Brazilian states and in the Federal District revealed that the prevalence of overweight/obesity in adolescents is higher in the south (34.4%) when compared to the other regions, and the lowest occurrence in the north (25.1%)⁶.

In this study, the prevalence of overweight/obesity was higher in males. In American adolescents prevalence of obesity was higher in males (18.1% vs. 11.5%)²³, and so was the prevalence found in Greeks (23.6% vs. 14.9%)²⁴. In Brazil, findings are inconsistent, with results of higher prevalence of overweight/obesity in boys⁶, and other results that did not point any association with sex¹².

A hypothesis that may explain this, is the fact that girls have, especially during adolescence, a higher concern about esthetics and body image²⁵, which may lead to a better care of their body weight.

Another factor associated with the occurrence of overweight/obesity was the dismissal of physical education classes, a fact that represented, in the multivariate analysis, an approximately 3-fold higher risk of overweight/obesity when compared to the adolescents that attended classes. Veugelers et al.²¹ showed that attending physical education classes twice a week or more, reduced in about 40% the chance of overweight and in about 50% the chance of obesity in adolescents, when compared to those who attended classes in a fewer number of days.

However, in Brazil, the relationship between attending physical education classes and overweight/obesity does not appear to present such a linear association. Evidence has shown that during physical education classes, in more than 90% of the time, students perform activities of low calorie burning²⁶, that is, with little direct impact on the accumulation of body fat.

One hypothesis is that the students with overweight/obesity are less physically fit and feel discouraged from participating in physical education classes, and then seek dismissal²⁷. Longitudinal studies should verify this hypothesis.

Reporting a good relationship with classmates was also associated with a higher risk of presenting overweight/obesity (PR=1.57; 95%CI 1.12-2.19). Silveira et al.²⁸ verified that a good interpersonal relationship is associated with excess weight, since the report of having a best friend was about five times higher in adolescents with overweight/obesity when compared to eutrophic adolescents. This excluded the hypothesis that being lonely is linked to excess weight.

The study by Christakis and Fowler²⁹ aimed to perform a longitudinal analysis of the influence that a group of people have on the nutritional status

of others. One of the results showed that the likelihood of becoming obese increases by 57% if a friend becomes obese, a relation that is even stronger among individuals of the same sex. These results show the influence that the group can play in the occurrence of overweight/obesity and its importance in strategies of prevention and control of overweight/obesity.

The present study has some limitations: first, due to the cross-sectional design, as it is not possible to determine a causal relationship between some variables; secondly, the study may present a selection bias because non-school adolescents with a discrepancy in the relation age/grade or studying in the night shift could not make up the sample. However, it is emphasized that this study included individuals from all regions of the municipality and all types of schools, in order to reduce this limitation.

It can also be noted that sample size affects the power of statistical analyses. The sample size of this study was accurate to determine a prevalence of 24%, with a variation of 4 percentage points. In addition, all association measures with a difference of 50% or higher among the groups were detected as significant ($p < 0.05$). Therefore, it is believed that the sample size did not influence the results.

In this study, we chose to use cutoff points for BMI specific for Brazilian adolescents¹⁴, which may raise the hypothesis of difficulties in comparisons with studies using other cutoff points described in the literature. However, a recent study found that the prevalence and associated factors related to this reference are similar to those found using international values, and there is a strong consistency between them³⁰.

CONCLUSIONS

In this study, approximately one in every four adolescents was overweight or obese. This occurrence was higher among males, students dismissed from physical education, and those who reported to have a good relationship with classmates.

Physical education classes may represent an important moment for the fight against overweight/obesity in this age group, particularly, if health promotion strategies are considered in these spaces. In addition, interpersonal relations should be considered in programs for prevention and control of overweight/obesity in adolescents.

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