Prevalence of excess weight and associated factors in adolescents of private schools of an Amazonic urban area, Brazil

Prevalência de excesso de peso e fatores associados em adolescentes de escolas privadas de região urbana na Amazônia

Prevalencia de exceso de peso y factores asociados en adolescentes de escuelas privadas de región urbana en Amazonia

Laércio M. Silva Júnior[1], Angelita Pereira dos Santos[2], Orivaldo Florencio de Souza[3], Edson dos Santos Farias[4]

ABSTRACT

Objective: To assess the prevalence and factors associated with excess weight among high school students.

Methods: Cross-sectional study with 741 adolescents from private schools in Rio Branco, Acre, Northern Brazil. The weight and height were prospectively measured in order to calculate the body mass index. Overweight was defined according to World Health Organization references in 2007. The following variables were collected: gender, age, socioeconomic status, parental education, number of household members and siblings, physical activity, time watching TV and computer time. Factors associated with excess weight were identified by multiple Poisson regression using the backward elimination procedure for variable selection.

Results: The prevalence of overweight was 29.5%. Males showed righer prevalence (33.2%) compared with females (26.4%). As for age, the prevalence was higher at 14 years (40%) in both genders. In the multivariate analysis, adjusted for age and gender, more than two hours in the computer per day and a sedentary lifestyle were associated with excess weight.

Conclusions: Excess weight is a serious public health problem in high school students from private institutions of an urban area of the Amazonia Region. The promotion of physical activity and the reduction of time in the computer should be considered as strategies to improve the health of adolescents.

Key-words: overweight; obesity; social class; motor activity; adolescent behavior.

RESUMO

Objetivo: Analisar a prevalência e fatores associados ao excesso de peso corporal em adolescentes do ensino médio.

Métodos: Estudo transversal com 741 adolescentes de escolas privadas de Rio Branco, Acre. O peso e a altura foram aferidos de forma prospectiva e o índice de massa corporal calculado, definindo-se excesso de peso de acordo com a curva de referência da Organização Mundial da Saúde de 2007. Coletaram-se informações quanto a sexo, idade, classe socioeconômica, escolaridade dos pais, número de moradores no domicílio, número de irmãos, atividade física, tempo gasto assistindo à televisão e tempo de uso de computador. Os fatores associados ao excesso de peso foram identificados mediante regressão múltipla de Poisson e utilizando-se o procedimento de eliminação retrógrada para a seleção das variáveis do modelo múltiplo.

Resultados: A prevalência de excesso de peso foi de 29,5%. O sexo masculino mostrou maior prevalência (33,2%) em comparação ao feminino (26,4%). Quanto à

Instituição: Universidade Federal do Acre (Ufac), Rio Branco, AC, Brasil
[1]Graduando em Medicina pela Ufac, Rio Branco, AC, Brasil
[2]Especialista em Treinamento Desportivo pela Unidade de Ensino Superior Vale do Iguaçu (Uniguaçu); Docente do Centro de Ciências da Saúde e Desporto da Ufac, Rio Branco, AC, Brasil
[3]Doutor em Saúde Pública pela Universidade de São Paulo (USP); Docente do Centro de Ciências da Saúde e Desporto da Ufac, Rio Branco, AC, Brasil
[4]Doutor em Saúde da Criança e Adolescente pela Unicamp; Docente do Centro de Ciências da Saúde e Desporto da Ufac; Rio Branco, AC, Brasil

Endereço para correspondência:
Edson dos Santos Farias
Avenida Sete de Setembro, 1.516 – casa 25 – Conjunto Nova Esperança
CEP 69900-000 – Rio Branco/AC
E-mail: esfarias@bol.com.br

Conflito de interesse: nada a declarar

Recebido em: 27/6/2011
Aprovado em: 31/10/2011

idade, a prevalência foi maior aos 14 anos (40%) em ambos os sexos. Na análise múltipla, ajustada pela idade e sexo, o uso de computador acima de duas horas diárias e o sedentarismo associaram-se ao excesso de peso.

Conclusões: O excesso de peso apresenta-se como um sério problema de saúde pública em escolares do ensino médio de instituições particulares de Rio Branco, Acre. Sugere-se a promoção da atividade física e a redução no tempo de uso de computador para o declínio do excesso de peso.

Palavras-chave: sobrepeso; obesidade; classe social; atividade motora; comportamento do adolescente.

RESUMEN

Objetivo: Analizar la prevalencia y los factores asociados al exceso de peso corporal en adolescentes de la secundaria.

Métodos: Estudio transversal con 741 adolescentes de escuelas privadas de Rio Branco, Acre (Brasil). El peso y la altura fueron medidos de modo prospectivo y el índice de masa corporal calculado, definiéndose exceso de peso conforme a la curva de referencia de la Organización Mundial de la Salud de 2007. Se recogieron informaciones respecto a sexo, edad, clase socioeconómica, escolaridad de los padres, número de moradores en el domicilio, número de hermanos, actividad física, tiempo gasto asistiendo a la televisión y tiempo de uso de computadora. Los factores asociados al exceso de peso fueron identificados mediante regresión múltiple de Poisson y el uso de eliminación retrógrada para la selección de las variables del modelo múltiple.

Resultados: La prevalencia de exceso de peso fue de 29,5%. El sexo masculino mostró mayor prevalencia (33,2%) en comparación al femenino (26,4%). Respecto a la edad, la prevalencia fue superior a los 14 años (40%) en ambos sexos. En el análisis múltiple, ajustado por edad y sexo, el uso de computadora por más que dos horas diarias y el sedentarismo se asociaron al exceso de peso.

Conclusiones: El exceso de peso se presenta como un serio problema de Salud Pública en escolares de la secundaria de instituciones privadas de Rio Branco, Acre (Brasil). Se sugiere la promoción de la actividad física y la reducción en el tiempo de uso de computadora para la disminución del exceso de peso.

Palabras clave: sobrepeso; obesidad; clase social; actividad motora; comportamiento del adolescente.

Introduction

Excess weight (overweight and obesity) is now considered a public health problem in many countries, both developed and in development. Popkin[1] has described the characteristics of the dietary habits and physical activity habits of today's urbanized society resulting from nutritional transition and shown how they contribute to increasing levels of obesity in the worldwide population. Brazilian studies have shown that prevalence is elevated here too, with a trend for excess body weight to increase among adolescents[2-4]. The most recent national surveys of excess weight in adolescents indicate that prevalence has almost tripled in 30 years[5].

A hypothesis proposed by Barker[6] postulates that health status at the start of life may program health in later stages. In the same vein, international studies have found that children diagnosed as obese are at greater risk of obesity during adolescence and adulthood[7,8]. Obesity is associated with dyslipidemias, type 2 Diabetes mellitus, coronary artery diseases, respiratory problems, degenerative arthropathy, arterial hypertension and increased risk of certain types of cancer[9,10]. This is why prevention of excess weight in childhood and adolescence is necessary.

Schools can be considered environments that have an important impact on behavior and lifestyle choices, since children spend so much of their time there. Therefore, in addition to socio-familial characteristics, dietary and physical activity habits acquired during school years can have an influence on excess weight[11]. The objectives of this study were to determine the prevalence of excess weight and factors associated with it in adolescents at private secondary schools in Rio Branco, Acre, Brazil, in 2009.

Methods

This was a cross-sectional, school-based, descriptive study conducted during the second half of 2009 with adolescent schoolchildren from private secondary schools in the city of Rio Branco, Acre state, which is in the Western Brazilian Amazon, in the country's North administrative region.

Rio Branco's private school population was estimated at 1,747 students of both sexes enrolled at 11 Secondary Schools and aged 14 to 18 years (data provided by the State Education Department's statistics service).

Sample size was calculated for a 22% estimated prevalence of excess weight (overweight + obesity)[12], sampling error of three percentage points, 95% confidence level and a total population of 1,747 students. On this basis, the minimum sample size was estimated at 516 students. This figure was then increased by 40% to cover refusals and losses and so the initial study sample was 741 students.

A probabilistic sampling process was employed, utilizing a three-stage stratified proportional sampling frame, Neyman proportional allocation, as follows: a) Randomized selection of schools; b) Randomized selection of grades, by class; c) Randomized selection of schoolchildren[13,14]. Each of the 11 private schools in the city had an equal likelihood of being selected using this sampling frame and in the event 5 were selected.

Data collection was conducted after permission had been granted by the schools' administrations, the students' parents and the students themselves, all of whom signed free and informed consent forms. The study was approved by the Human Research Ethics Committee at the Universidade Federal do Acre (UFAC).

Questionnaires on socioeconomic data and physical activity were administered in the classroom by teachers and students of Medicine and Physical Education from UFAC. At least one teacher from the school being studied was present in each classroom during data collection. The questionnaires were made up of closed questions.

Independent variables analyzed were sex, age (in years, to two decimal places), parents' educational level, number of residents in household, number of siblings, time spent watching television (≤2 hours, 2–4 hours or ≥4 hours), time spent using a computer (≤2 hours, 2–4 hours and ≥4 hours), socioeconomic level[15], categorized as high, medium or low. Physical activity levels were estimated using the short form of the International Physical Activity Questionnaire[16]. Physical activity levels were classified as inactive (mild activity involving little physical effort) or active (moderate activity requiring prolonged physical effort and activity requiring intense physical effort).

Subjects were weighed using a portable electronic digital balance, sensitive to 50g and with a maximum capacity of 150kg. Height was measured using a 2m portable stadiometer with 0.1cm divisions. Weight and height were measured according to procedures described by Lohman, Roche and Martorell[17]. WHO AnthroPlus software was used to calculate z scores for body mass index against age (BMI/age) using the new World Health Organization references[18] (WHO, 2007). The 2007 WHO cutoff points were used to classify subjects into healthy weight (z score <+1) or excess weight (z score ≥+1) groups.

Statistical analysis of data was conducted using the svy module in Stata™ 9.2. Prevalence rates and their respective 95% confidence intervals were calculated. Factors associated with excess weight were analyzed in two stages. Initially, independent variables that had associations with excess weight of $p<0.20$ (chi-square test for homogeneity) were selected as candidates for a multivariate model. Poisson multivariate regression with backward elimination was then used to identify factors associated with excess weight. Variables with $p<0.05$ were considered to be factors associated with excess weight. Age and sex were used as adjustment variables during all stages of constructing the multiple model.

Results

A total of 741 adolescent schoolchildren aged 14 to 18 were interviewed for this study. Three hundred and forty of them were male (45.9%) and 401 (54.1%) were female. The prevalence of excess weight was 29.5%. Prevalence was greater among males (33.2%) than females (26.4%). With regards to age, prevalence was greatest at 14 years (40%) in both sexes. Sixteen-year-old males (28.0%) and 18-year-old females (22.2%) had the lowest excess weight prevalence rates (Table 1).

Table 2 lists excess weight prevalence rates and prevalence ratios for schoolchildren at private secondary schools in Rio Branco. The explanatory variables socioeconomic level, time spent using a computer and physical activity

Table 1 - Prevalence of excess weight by age and sex in adolescents from private secondary schools in Rio Branco, Acre, Brazil, 2009

	Male		Female		Total	
	n	%	n	%	n	%
14 years	40	40.0	35	40.0	75	40.0
15 years	86	38.3	121	23.1	207	29.7
16 years	100	28.0	139	25.9	237	26.7
17 years	86	30.2	88	27.7	174	28.7
18 years	28	35.7	18	22.2	46	30.4
All ages	340	33.2	401	26.4	741	29.5

Tabela 2 - Excess weight prevalence and prevalence ratios for adolescents from private secondary schools in Rio Branco, Acre, Brazil, 2009

	n	%	RP	95%CI	*p*-value
Sex					
Male	340	33.2	1.00		
Female	401	26.4	0.79	(0.52–1.20)	0.202
Age (years)					
14	75	40.0	1.00		
15	207	29.4	0.73	(0.35–1.54)	0.315
16	239	26.7	0.66	(0.32–1.39)	0.204
17	174	28.7	0.71	(0.32–1.57)	0.307
18	46	30.4	0.76	(0.43–1.31)	0.238
Socioeconomic level					
High	658	30.8	1.00		
Medium or Low	83	19.2	0.62	(0.31–1.23)	0.129
Head of family's educational level					
Higher education	473	29.6			
Primary and secondary education	268	29.4	0.99	(0.67–1.47)	0.978
Number of residents in household					
> More than 3 residents	520	29.2	1.00		
≤ Less than 3 residents	221	30.2	1.03	(0.79–1.35)	0.727
Number of siblings					
> More than 2 siblings	176	30.1	1.00		
≤ Less than 2 siblings	565	29.3	0.97	(0.65–1.45)	0.872
Time spent watching television					
≤ Less than 2 hours	234	26.9	1.00		
> More than 2 hours	507	30.7	1.14	(0.76–1.70)	0.407
Time spent using a computer					
≤ Less than 2 hours	290	25.1	1.00		
> More than 2 hours	451	32.3	1.28	(0.94–1.75)	0.088
Physical activity					
Active	450	22.2	1.00		
Inactive	291	40.8	1.84	(0.93–3.62)	0.067

RP: prevalence ratio; 95%CI: 95% confidence interval

Tabela 3 - Factors associated with excess weight in adolescents from private secondary schools in Rio Branco, Acre, Brazil, 2009

	PR*	95%CI	*p*-value
Time spent watching television			
≤ Less than 2 hours	1.00		
> More than 2 hours	1.20	(1.04–1.39)	0.023
Physical activity			
Active	1.00		
Inactive	1.87	(1.00–3.51)	0.049

PR: prevalence ratio; *adjusted for age and sex

were selected as candidates for the final model. After multivariate analysis and adjustment for age and sex, the variables time spent using a computer (more than 2 hours) and physical activity level (inactive) remained associated with excess weight (Table 3).

Discussion

This is one of the first studies conducted in the Brazilian state of Acre to use the WHO's new 2007 recommendations to determine the prevalence of excess weight in schoolchildren from private secondary schools. It was found that the prevalence of excess weight was elevated, at 29.5% of adolescents of both sexes aged 14 to 19 years, which is indicative of an emerging public health problem and is associated with inactive lifestyles.

Comparisons of the prevalence of excess weight among the schoolchildren studied here with previous Brazilian and international investigations is confounded by the use of different reference standards[18-19]. These standards diverge in terms of the statistical methods employed and the cutoff points used to diagnose of excess weight.

Notwithstanding, the 2007 WHO reference was chosen in view of the influx of immigrants that contributed to the composition of the population of Acre, since the 2007 standards are based on a representative multiethnic sample drawn from many different countries, including Brazil.

Although there are many published studies of excess weight prevalence in adolescent schoolchildren, few similar studies have been conducted in Rio Branco, Acre[20]. The 29.5% excess weight prevalence observed among schoolchildren from private schools in Rio Branco is higher than the percentage of excess weight observed for Brazilian adolescents aged 10 to 19 (20.5%) by the Family Budgets Survey (Pesquisa de Orçamentos Familiares)[5], which was conducted in 2008–9 and also used the 2007 WHO reference.

The prevalence observed here also differs from the results of studies of adolescents from private schools in several Brazilian towns. Data from the cities of Fortaleza[21] and Florianópolis[22] both show lower excess weight prevalence than was observed here among schoolchildren from Rio Branco. In contrast, data from the National Survey of Schoolchildren's Health[23] found higher rates of excess weight than were observed among the students from private schools in Rio Branco.

In Brazil, a linear relationship has been identified between family income measured in multiples of the minimum monthly wage and prevalence of excess weight among adolescents[5]. Particularly with reference to secondary education, there is a tendency in Brazil for students at private schools to come from high income families while children enrolled at public schools come from lower-income families. A study that used a reference standard similar to the 2007 WHO standard found a lower prevalence of excess weight among schoolchildren from public primary schools in Rio Branco (17.6%)[20] than was observed among the schoolchildren from private schools described here.

Suñé *et al*[12], conducted an investigation in the town of Capão da Canoa, in Rio Grande do Sul state, and observed 31.4% prevalence of excess weight among schoolchildren who spent more than 4½ hours engaged in sedentary activities (watching TV, playing video games, using computers). A study conducted in India found that time spent watching television and using computers was associated with excess weight[24]. The data presented here also confirm the association between hours spent using computers and excess weight prevalence. Adolescents who spent more than 2 hours per day in front of a computer were more likely to have excess weight. According to Lamounier and Abrantes[25], who conducted a review of the subject, the increase in obesity among adolescents is related to what can be considered a major phenomenon of the 1990s, i.e. proliferation of television and dissemination of internet access. As technology advances, children and adolescents are reducing the amount of time they spend watching television and increasing the time they spend using computers[26,27].

After adjustment for age and sex, inactive lifestyle was associated with excess weight. This evidence is similar to findings gathered by research conducted with adolescents in the South administrative region of Brazil, which showed that low levels of physical activity were associated with the prevalence of overweight and obesity[12]. In contrast, Tassitano *et al*[28] analyzed adolescents from the state of Pernambuco and did not detect a significant association between being active and overweight or obesity. Seemingly contradictory results were reported by Terres *et al*[29], who found that overweight adolescents in Pelotas engaged in physical activity outside of school. This could be an example of reverse causality, by which the adolescents began to exercise after gaining excess weight. Additionally, the differences between these investigations' results could be linked to use of different data collection and analysis methodologies.

With regard to the limitations of this study, the cross-sectional design makes it impossible to identify the temporal relationships between the independent variables and excess weight. Memory bias, however, can be assumed to have been kept to a minimum since students were reporting on recent occurrences.

Considering that adolescents spend a large proportion of their time at school, the physical activity and dietary habits that they acquire during their school years can impact on their nutritional status. By the same token, schools are potentially good places to diagnose excess weight and intervene to reduce it. Professionals from nine different countries[30] proposed a series of suggestions for preventing obesity in children and adolescents, recommending that schools should provide physical education classes and basic education on nutrition and the health benefits of physical activity. The elevated prevalence of excess weight observed among these adolescents from private secondary schools in Rio Branco highlights the need to plan and implement public policies designed to reduce to prevalence of excess weight and its comorbidities.

It can be concluded that the prevalence of excess weight among schoolchildren from private secondary schools in Rio Branco, Acre, Brazil, in 2009 was elevated and was associated with the number of hours per day spent using a computer and with low physical activity levels.

References

1. Popkin BM. The nutrition transition and obesity in the developing world. J Nutr 2001;131:871S-3.
2. Farias ES, Guerra-Júnior G, Petroski EL. Nutricional status of schoolchildren in Porto Velho, Rondônia, Brazil. Rev Nutr 2008;21:401-9.
3. Pelegrini A, Silva DA, Petroski EL, Gaya AC. Overweight and obesity in seven to nine-year-old Brazilian students: data from the Brazilian Sports Project. Rev Paul Pediatr 2010;28:290-5.
4. Cardoso LO, Engstron EM, Leite LC, Castro IR. Socioeconomic, demograflhic, environmental and behavioral factors associated with overweight in adolescents: a systematic literature review. Rev Bras Epidemiol 2009;12:378-403.
5. Brasil. Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2008-2009 - Avaliação nutricional da disponibilidade domiciliar de alimentos no Brasil. Rio de Janeiro: IBGE; 2010.
6. Barker DJ. The fetal origins of adult hypertension. J Hypertens Suppl 1992;10:S39-44.
7. Guo SS, Chumlea WC. Tracking of body mass index in children in relation to overweight in adulthood. Am j Clin Nutr 1999;70:145S-8.
8. Wang Y, Ge K, Popkin BM. Tracking of body mass index from childhood to adolescence: a 6-y follow-up study in China. Am J Clin Nutr 2000;72:1018-24.
9. Enes CC, Slater B. Obesity in adolescence and its main determinants. Rev Bras Epidemiol 2010;13:163-71.
10. Weil EJ, Curtis JM, Hanson RL, Knowler WC, Nelson RG. The impact of disadvantage on the development and progression of diabetic kidney disease. Clin Nephrol 2010;74 (Suppl 1):S32-8.
11. Carter RC. The impact of public schools on childhood obesity. JAMA 2002;288:2180.
12. Suñé FR, Dias-da-Costa JS, Olinto MT, Pattussi MP. Prevalence of overweight and obesity and associated factors among schoolchildren in a southern Brazilian city. Cad Saude Publica 2007;23:1361-71.
13. Vanzelli AS, Castro CT, Pinto MS, Passos SD. Prevalence of overweight and obesity among children of public schools in the city of Jundiaí, São Paulo, Brazil. Rev Paul Pediatr 2008;26:48-53.
14. Silva NN, editor. Amostragem probabilística: um curso introdutório. 2ª ed. São Paulo: Edusp; 2001.
15. Associação Brasileira de Empresas de Pesquisa [homepage on the Internet]. Critério de classificação econômica - 2010 [cited 2010 Mar 05]. Available from: http://www.abep.org/novo/Content.aspx?ContentID=301
16. Guedes DP, Lopes CC, Guedes JE. Reproducibility and validity of the International Physical Activity Questionnaire in adolescents. Rev Bras Med Esporte 2005;11:151-8.
17. Lohman TG, Roche AF, Martorell R, editors. Anthropometric standardization reference manual. Champaign: Human Kinetics Pub; 1988.
18. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. Bull World Health Organ 2007;85:660-7.
19. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000;320:1240-3.
20. Souza OF, Farias ES. Underweight and overweight in school children from Rio Branco, Acre State, Brazil. Rev Bras Crescimento Desenvolv Hum 2011;21:878-82.
21. Araújo MF, Almeida LS, Silva PC, Vasconcelos HC, Lopes MV, Damasceno MM. Overweight among adolescents from private schools in Fortaleza, CE, Brazil. Rev Bras Enferm 2010;63:623-8.
22. Silva KS, Pelegrini A, Hoefelmann LP, Vasques DG. Lopes AS. Prevalência de excesso de peso corporal em escolas públicas e privadas da cidade de Florianópolis, SC. Arq Bras Endrocrinol Metab 2008;52:574-5.
23. Araújo C, Toral N, Silva AC, Velásquez-Melendez G, Dias AJ. Nutritional status of adolescents and its relation with socio-demographics variables: National Adolescent School-based Health Survey (PeNSE), 2009. Cien Saude Colet 2010;15 (Suppl 2):3077-84.
24. Kotian MS, Kumar SG, Kotian SS. Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka, India. Indian J Community Med 2010;35:176-8.
25. Lamounier JA, Abrantes MM. Prevalence of obesity and overweight in Brazilian adolescents. Rev Med Minas Gerais 2003;13:275-84.
26. Pérez A, Hoelscher DM, Springer AE, Brown HS, Barroso CS, Kelder SH *et al*. Physical activity, watching television, and the risk of obesity in students, Texas, 2004-2005. Prev Chronic Dis 2011;8:A61.
27. Shi L, Mao Y. Excessive recreational computer use and food consumption behaviour among adolescents. Ital J Pediatr 2010;36:52.
28. Tassitano RM, Barros MV, Tenório MC, Bezerra J, Hallal PC. Prevalence of overweight and obesity and associated factors among public high school students in Pernambuco State, Brazil. Cad Saude Publica 2009;25:2639-52.
29. Terres NG, Pinheiro RT, Horta BL, Pinheiro KA, Horta LL. Prevalence and factors associated to overweight and obesity in adolescents. Rev Saude Publica 2009;40:627-33.
30. Speiser PW, Rudolf MC, Anhalt H, Camacho-Hubner C, Chiarelli F, Eliakim A *et al*. Childhood obesity. J Clin Endocrinol Metab 2005;90:1871-87.