Original Article

Prevalence of physical inactivity and associated factors among adolescents

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ABSTRACT

Objective. To estimate the prevalence of physical inactivity among adolescents (aged 14 to 18 years) in the municipality of Maringá, state of Paraná, Brazil and to explore its association with demographic, socioeconomic and behavioral variables and nutritional status indicators.

Methods. Cross-sectional study with a representative sample of 991 high school students (54.5% of girls) from both public and private high schools selected through multi-stage random sampling. Habitual physical activity was assessed using the International Physical Activity Questionnaire (IPAQ) adapted for adolescents, with the previous week taken as reference period. Physical inactivity was defined as <300 min/week of moderate and vigorous physical activity. Independent variables studied were: sex, age, type of school, socioeconomic level, smoking, sedentary behavior (≥4 h/day), nutritional status, and abdominal obesity.

Results. The prevalence of physical inactivity among adolescents was 56.9% (girls= 57.9%, boys= 55.7%, p=0.46). Risk factors associated with physical inactivity were lower socioeconomic level, attendance to public schools and obesity.

Conclusion. A high prevalence of physical inactivity was found in the population investigated. The development of strategies to increase physical activity among adolescents are urgently needed. It can be achieved through content-based activities that promote a healthy lifestyle.

Keywords: Motor Activity. Epidemiology. Questionnaires. Adolescent Behavior.

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Introduction

Physical activity in adolescence has several health benefits, such as weight control and maintenance[1] and reduction of cardiovascular risks.[2] Moreover, cohort studies have evidenced that physical inactivity during childhood and/or adolescence tends to continue into adulthood, becoming difficult to change.[3] Therefore, programs to stimulate physical activities in this age range should be a priority for public health policies and a focus for teachers.

Despite the acknowledgement that physical activity is important for health, there are still few population-based or school-based studies about the topic among adolescents in Brazil. Previous research has shown very high prevalence rates of physically inactive adolescents and a strong association with demographic, socioeconomic and biological factors.[4,5] However, a recent review study emphasized important methodological differences in the literature, with distinct instruments and cutoff points, which frequently prevent comparisons among studies.[6]

The objectives of this study were to estimate the prevalence of physically inactive adolescent high school students in the South of Brazil and to explore the association of physical inactivity with demographic, socioeconomic, indicators of nutritional status, and behavioral variables.

Methods

A cross-sectional study was conducted in Maringá, a municipality with 326,000 inhabitants in the northwest of the state

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of Paraná, in the South of Brazil. Maringá has a high Human Development Index (HDI= 0.84, while HDI for Brazil is 0.79).[7]

After having received a formal request and information on the importance, the objectives and the methodology of this study, the school board of each school selected gave permission for this study to be conducted. This study was approved by the Research Ethics Committee of Centro Universitário de Maringá, in accordance with Brazilian laws.

Sampling

Sample selection was done in two stages. A 95% confidence level and a 5% margin of error were assumed and the estimated prevalence was of 50%, with a design effect of 2. Based on this, it was estimated that data from 734 adolescents would have to be collected. Due to other objectives of the research project and to possible occasional losses and refusals, an extra 20% of adolescents were added to the sample. In the first stage, the number of schools with students within the age range under study was identified (n = 38 schools), and then schools were selected according to the probability proportional to the number of students within the eligible age range and to the type of school (public or private). Eight public schools and four private schools were selected. In the second stage, simple random sampling was used to select groups in each school, so that the proportion of students in each year (1st to 3rd year of high school) would be maintained. Sample size enabled a prevalence estimate of 50% of physical inactivity in each age group, with a 4% margin of error. Furthermore, prevalence ratios of 1.3 were statistically significant at the 5% level, with a power of 80% for 50% prevalences.

All students from the selected groups who were present at the day of data collection were considered eligible to participate in the study after their parents or guardians gave a written consent and the students themselves gave their verbal consent.

Variables

The International Physical Activity Questionnaire (IPAQ) short, 8th version was used to collect information on habitual physical activity, with the previous week taken as reference.[8,9] Physical inactivity was established with a cutoff level of 300 minutes of moderate/vigorous physical activity per week, in accordance with current guidelines of physical activity for adolescents.[10]

Independent variables investigated were: sex; age; type of school; socioeconomic level [classified according to criteria of the Brazil Criterion of Economic Classification (Critério de Classificação Econômica Brasil, Associação Brasileira de Empresas de Pesquisa)[11] into levels A (highest), B, C, D, or E (lowest) taking into consideration, among other aspects, consumer goods available at home]; type of school (public or private); nutritional status [based on the body mass index (BMI), adolescents were nutritionally classified according to cutoff points for sex and age[12]]; abdominal obesity (based on evaluation of waist circumference and according to cutoff points for sex and age[13]); smoking (those who reported smoking at least one cigarette in a habitual week were considered to be smokers); and sedentary behavior (time spent in front of the television, computer/games). Excessive time spent in front of television, computer/games was established to be ≥ 4h/day.

Data were collected by a team of four interviewers previously trained in two pilot studies, with one week of interval, at schools that were not included in the final sample. Kappa coefficient was used to verify agreement between both questionnaire applications. The agreement observed was high (k=0.91).

Statistical treatment of information was performed with Stata® version 8.0. At first, the proportion of physically inactive adolescents was analyzed according to each independent variable. Crude and adjusted prevalence ratios (PR) with 95% confidence interval (95%CI) were calculated with Poisson regression, which is recommended for high prevalence outcomes.[14] Adjusted analysis was performed according to a four-level, hierarchical model determined a priori: 1) sex, age, socioeconomic level; 2) nutritional status and abdominal obesity; 3) smoking; and 4) sedentary behavior. In this model, the effect of each variable on the outcome is adjusted for other variables in the same level or above in the hierarchical model.[15] For a variable to be retained in the model, significance level was set at $p<0.20$. Statistical significance was established at 5%.

Results

The number of adolescents selected at public and private schools was 774 and 492 students, respectively. In this sample, there were 275 losses/refusals: 92 students were absent from school in the days data were collected (76.1%, n=70, students from public schools) and 183 students did not bring the consent form or refused to answer the questionnaire or undergo assessments (82%, n=150, students from private schools). Therefore, the final sample included 991 adolescent high school students (67.7%, n=671, students from public schools).

The sample was comprised of 67.7% of adolescents from public institutions, 55.5% of girls, 6.1% of students belonging to D and E socioeconomic levels (the lowest), 77.2% of students classified as normal weight (nonobese), and 32.7% of students with abdominal obesity. The mean age, body mass and height were: 16.3±0.9 years, 61.3±12.6 kilos and 168.9±13 centimeters, respectively.

Table 1 presents the prevalence of physical inactivity according to independent variables. Results show a high

prevalence of physical inactivity among the assessed adolescents; more than half of the sample does not perform any physical activity for ≥ 300 min/week. Regarding independent variables, adolescent students from private schools showed a lower prevalence of physical inactivity in comparison to their peers from public schools ($p=0.0001$). The other independent variables were not statistically significant. However, the prevalence of sedentary behavior (more than 4 hours/day) was also high, similar to the prevalence of physical inactivity.

Among risk factors for physical inactivity (<300 min/week), there was no linear trend associated with age. The probability of obese adolescents being physically inactive was higher if compared to normal adolescents (PR=1.31 95%CI=1.10-1.55). It was also observed that students from private schools had a lower probability of being physically inactive (PR=0.82 95%CI=0.72-0.95, $p=0.009$). In the crude analysis, the high economic level (A) was associated with the outcome; however, after being adjusted in the hierarchical model, it lost its statistical significance (Table 2).

Discussion

Our results showed that more than half (56.9%) of the assessed adolescents were not used to performing any physical activity for ≥ 300 min/week. Comparisons of

Table 1. Prevalence (%) of physical inactivity according to the independent variables studied among adolescent high school students from Maringá, state of Paraná, Brazil

Variable	n (%)	Physical inactivity %	p
Sex			0.46
Male	451 (45.5)	55.7	
Female	540 (54.5)	57.9	
Age			0.06
14	86 (8.7)	51.2	
15	286 (28.8)	57	
16	369 (37.2)	53.5	
17 and 18	250 (25.2)	63.8	
Socioeconomic level*			0.23
A (high)	140 (14.1)	41.4	
B	521 (52.6)	61.8	
C	270 (27.2)	55.2	
D, E (low)	60 (6.1)	58.3	
Type of School			0.0001
Public	671 (67.7)	61.3	
Private	320 (32.3)	47.8	
Smoking			0.16
No	934 (94.2)	56.4	
Yes	57 (5.8)	64.9	
Nutritional status			0.37
Underweight	32 (3.2)	59.4	
Normal	765 (77.2)	56.6	
Overweight	132 (13.3)	51.5	
Obese	62 (6.3)	70.8	
Abdominal obesity			0.31
No	667 (67.3)	58.0	
Yes	324 (32.7)	54.6	
Sedentary behavior (≥ 4h/day)			0.61
No	181 (18.3)	55.3	
Yes	810 (81.7)	57.3	
Total	991	56.9	

*Brazilian economic classification criteria according to the Brazil Criterion of Economic Classification (Critério de Classificação Econômica Brasil, Associação Brasileira de Empresas de Pesquisa)[11].
Wald test for heterogeneity.
Wald test for linear trend.

Table 2. Crude and adjusted prevalence ratios (PR), with 95% confidence interval (95%CI), according to independent variables for adolescent high school students from Maringá, state of Paraná, Brazil.

Level[a]	Variable	Physical inactivity			
		Crude analysis		Adjusted analysis	
		PR (95%CI)	*p*	PR (95%CI)	*p*[b]
1	Sex		0.46		0.59
	Male	0.96(0.86-1.07)		0.97(0.87-1.08)	
	Female	1.00		1.00	
	Age		0.06		0.45
	14	1.00		1.00	
	15	1.11 (0.88-1.40)		1.11 (0.90-1.37)	
	16	1.04 (0.83-1.31)		0.99 (0.80-1.22)	
	17 and 18	1.24 (0.99-1.56)		1.14 (0.92-1.41)	
	Socioeconomic level*		0.23		0.79
	A (high)	0.71 (0.53-0.94)		0.81 (0.60-1.09)	
	B	1.05 (0.84-1.32)		1.11 (0.89-1.39)	
	C	0.94 (0.74-1.20)		0.95 (0.75-1.21)	
	D E (low)	1.00		1.00	
	Type of school		0.0001		0.009
	Public	1.00		1.00	
	Private	0.78 (0.68 - 0.88)		0.82 (0.72-0.95)	
2	Smoking		0.16		0.10
	No	1.00		1.00	
	Yes	1.15 (0.94-1.40)		1.16 (0.96-1.41)	
3	Nutritional status		0.37		0.37
	Underweight	1.04 (0.78-1.40)		1.04 (0.78-1.40)	
	Normal	1.00		1.00	
	Overweight	0.91 (0.76-1.08)		0.91 (0.76-1.08)	
	Obese	1.25 (1.05-1.48)		1.31 (1.10-1.55)	
	Abdominal obesity		0.31		0.31
	No	1.00		1.00	
	Yes	0.94 (0.83-1.05)		0.94 (0.83-1.05)	
4	Sedentary behavior (≥ 4h/day)		0.62		0.91
	No	1.00		1.00	
	Yes	1.03 (0.89-1.19)		0.99 (0.86-1.15)	

* Brazilian economic classification criteria according to the Brazil Criterion of Economic Classification (Critério de Classificação Econômica Brasil, Associação Brasileira de Empresas de Pesquisa)[11].

[a]The effect of each variable is controlled for other variables belonging to the same or higher hierarchical levels.

[b]Variables with p>0.2 were not retained in the model.

Wald test for heterogeneity.

Wald test for linear trend.

the prevalence of physical inactivity among adolescents should be cautious, since the studies available in the literature use different instruments and cutoff points, as was observed in a recent review article.[6] Nevertheless, a comparison between studies conducted among American and Brazilian adolescents using the same cutoff points of the present study showed that results are similar: 55.9%[16] and 58.2%,[4] respectively. This is an alarming outcome, because physical activity patterns in adolescence tend to continue into adulthood[17].

According to studies conducted in Brazil[18] and around the world,[19] boys are more active than girls; however, differently from those studies, differences between sexes were not observed in our study, which was the reason why our analyses were not stratified. These results may partially be explained by the fact that boys have more social and family support to engage in physical activities[20].

In the present study, physical inactivity was positively associated with socioeconomic level; adolescents within the highest level had the lowest risk behavior. However, research results available in the literature are not consensual, so that a direct association between exposure and outcome cannot be made. Some international studies indicate a positive association,[21,22] whereas Brazilian studies indicate a negative association.[18,23] According to the literature, these differences may be explained by the demographic context of the population studied[24].

Adolescent students from private schools had a low prevalence of physical inactivity. Despite the apparent consensus on the fact that physical education classes promote a healthy lifestyle,[25] research results do not support this statement.[26,27] These research studies indicate the need to develop school contents on healthy lifestyle aiming at reducing physical inactivity and other risk behaviors, such as smoking and inadequate eating habits[28].

The nutritional status, classified according to BMI, was associated with physical inactivity; however, statistic significance was reached only for obese adolescents. These results corroborate previous studies which identified that physical activity among obese adolescents is lower than among normal adolescents,[29,30] further contributing to increase obesity, as observed in Brazil and in other countries[31,32].

Conclusion

In sum, the prevalence of physically inactive adolescents in our study was high, according to criteria currently adopted. Our results show that adolescent students from public schools and of lower socioeconomic levels are less active; thus, programs designed to promote physical activity, especially in the school environment of these adolescents, are urgently needed. Guidelines issued by governmental institutions, such as the Brazilian Ministry of Health (Ministério da Saúde) and US Centers for Disease Control and Prevention (CDC), may help train personnel to develop school-based programs.

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