

Anthropometric profile, eating habits and physical activity levels of students in a city in the state of São Paulo

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OBJECTIVE: To verify the prevalence of overweight in students aged 7 to 13 years in public schools in a city in the state of São Paulo; to compare the eating habits and physical activity levels of the students with those of their parents; to relate eating habits and physical activity levels to gender.

METHODS: This was a transverse observational study. Eighty-two children of both genders, aged 7 – 13 years, were evaluated, anthropometric data collected and body mass index for age was classified as per the Brazilian Ministry of Health “Food and Nutrition Monitoring System” (SISVAN); concurrently we applied a questionnaire for the analysis of physical activity levels and eating profiles for students and their parents. Data were analyzed through Kolmogorov-Smirnov tests, unpaired Student t test or Mann Whitney; for correlation analysis, we employed the Spearman or Pearson tests.

RESULTS: In this study, half of the students were found to be overweight, with an increased abdominal circumference. We also observed that better eating habits correlated with greater physical activity. Students consumed more fried food, sweets and fruit and ate more often than their parents; few of these parents regularly perform physical activity.

CONCLUSIONS: Excess weight has been found in half of the students evaluated in a small town with a high Human Development Index. It was also found that boys presented higher level of physical activity, number of meals and lower sweet intake. Furthermore, it was observed that better eating habits were associated with the level of physical activity.

KEYWORDS: overweight, obesity, exercise, eating behaviors, child.

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INTRODUCTION

Being overweight and obese are defined as having abnormal or excessive fat accumulation that harms health.^{1,2} It is occurring at an increasingly earlier age and at a greater frequency in the population. According to the World Health Organization,³ more than 40 million children under five years of age presented with overweight, worldwide, in 2012.

Data from the Brazilian Family Income Survey (FIS)⁴ illustrate that, in the period 1974 to 2009, obesity and being overweight increased from 32% to 40% of children aged 5 - 9 in the Southeast, South and Midwest of the country, and from 25% to 30% in the North and Northeast. Over the same interval, in individuals aged 10 to 19, the prevalence of being overweight increased from 3.7% to 21.7% in boys, and from 7.5% to 19.4% in girls.

Obesity is related to environmental factors, such as low or no levels of physical activity and poor eating habits;⁵ it is essentially caused by an imbalance between

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calories consumed vs. calories burned, in a scenario of high calorie food intake.³ This clearly accounts for this increase in the number of overweight individuals.⁶ People who decide to lose weight by dieting often do so without undertaking any associated physical activity,⁷ frequently with very little success. This is an alarming situation, because it is well established that obese children have a higher than 80% chance of becoming obese adults.⁸

Physical activity in childhood and adolescence, in addition to promoting the well-being of the individual, may be associated with a decreased risk of becoming overweight or obese, a factor of the utmost importance with regard to cardiovascular and musculoskeletal health.⁹ Studies show that proper nutrition and frequent physical activity also act in the regulation of energy balance, keeping a leaner body mass and promoting weight loss, all of which may contribute to a lower prevalence of being overweight.¹⁰⁻¹²

Nutritional behavior in the social life of children can be influenced by parents, and family members, all of which are essential to prevent and even reduce obesity in childhood.¹³ The hypothesis behind this study was that a large percentage of children may present excess weight which can be associated with similar habits of their parents. This may be associated with a lack of physical activity, resulting in a variety of consequences, such as, for instance, cardio-metabolic disorders. Anthropometric indicators have been successfully applied to predict serum triglycerides and hypertriglyceridemia in older adults;¹⁴ They have likewise been used to compare conditions of older adults in distinct regions of Brazil.¹⁵

The objective of this study was to verify the prevalence of people being overweight, relate the eating habits and physical activity levels to gender in students 7 to 13 years old, and to compare their dietary habits and level of physical activity with those of their parents. Our sample was drawn from the public education network of a city in the State of Sao Paulo.

■ METHODS

A transverse observational research approach was selected. The data collection was from February to September 2015. This research was approved by the Universidade do Oeste Paulista – UNOESTE Ethics Committee, CAAE number 40470814.0.0000.5515.

Eighty-two students were evaluated in total, including both genders, aged 7 - 13 years; 82 parents who were responsible for these children were likewise included. Students were selected from two public schools in the municipality of Álvares Machado (population 25,000, high Human Development Index), in the state of São Paulo, Brazil.

The inclusion criteria for participation in this study were (a) authorization of individuals and parent or guardian; (b) signing of an informed consent by the parent

or guardian responsible and the acceptance of participation by the child. We excluded children with neurological disorders or metabolic alterations that would not allow, or would interfere with the findings of this research, as reported by the school teacher or person responsible for the individual, and diagnostically confirmed by a doctor.

This research was conducted in three phases: (1) the student's anthropometric assessment and body mass index classification by age (BMI/age); (2) the application of a questionnaire for physical activity level and analysis of the food intake profile for the children, and (3) the application of a physical activity questionnaire and food intake profile for parents or guardians.

During the first phase, we collected the following data for the included children: gender, age, weight, and height, measured in an appropriate place in the school. Weight was measured in kilograms (kg) by means of a portable digital Plena® scale, (maximum capacity was 160kg and sensitivity was 0.1kg) with the child barefoot, arms along the body. Height was measured in meters, by means of a tape (sensitivity: 0.01m), with the child barefoot, in an orthostatic stance, with the occiput, shoulders, pelvic girdle, and heel in contact with the wall, and head at the horizontal plane of Frankfurt. The abdominal circumference (using the same tape, parallel to the ground at the level of the umbilical scar) was measured with the feet together, a relaxed abdomen, arms along the body.

The classification of BMI/age was analyzed in accordance with the food and nutrition monitoring system (SISVAN),¹⁶ used for Brazilian populations and adapted from World Health Organization procedures,³ by comparison with growth curves, using the ratings for five to 10 years and over 10 years.

The physical activity level was evaluated in the second phase, through a Usual Physical Activity Questionnaire,¹⁷ with reference to the previous 12 months. The questionnaire is divided into three sections: (1) Occupational Physical Activity score (OPA); (2) Physical Exercises at Leisure score (PEL), (3) Leisure Activity and Locomotion (LAL). In this study, the Occupational Physical Activity score (OPA) was not applied, due to the age of the studied population, and because this information has been previously described.¹⁸ PEL consists of information about the physical exercise programs, sports activities and leisure practices, and LAL evaluates the activities of free time occupation and locomotion.

The food intake profile of the students was assessed in the third phase, through a questionnaire prepared by the authors and based on the study of Fernandes et al,⁸ that covers issues regarding frequency of intake of fried foods, sweets, soda, salads, vegetables, and fruit on a weekly basis; in addition, we determined the number of times the children ate on a daily basis.

Parents or guardians were assessed through a questionnaire prepared by the authors, which checked

the level of physical activity and food intake profile, including information about the type of physical activity, and duration and frequency of weekly practice. To analyze the food profile, we used the same questions applied to the children with the addition of questions relating to the presence/absence of health alterations, such as, for instance, cardiovascular disease. These questionnaires were administered by the schools' teachers.

All information was collected individually by previously trained staff. After the completion of data collection, guidelines were established and delivered in the shape of informative brochures to participant schoolchildren: the brochure explained the consequences of being overweight and the importance of physical exercise and of adequate nutritional habits.

Data analysis was performed through the statistical software GraphPad Prism. The normality of the data was evaluated by the Kolmogorov-Smirnov test. For comparisons of independent samples; we used the unpaired Student t test or the Mann-Whitney test, depending on the normality of the data. Correlations were analyzed through the Spearman test for nonparametric, or the Pearson test for parametric data. The significance level was set at 5%.

■ RESULTS

Eighty-two students were evaluated, 36 (43.9%) male, aged 8.69 ± 1.28 years and 46 (56.10%) female aged of 8.56 ± 1.32 years. The anthropometric data are presented in Table 1, which shows the presence of significantly greater weight and BMI in males vs. females.

In the classification of BMI/age, according to SISVAN, we found 39 (47.56%) who were eutrophic; two (2.46%) were thin, 15 (18.29%) presented a risk for overweight, 16 were overweight (19.51%) and 10 were obese (12.20%). Among the 41 (50%) in the overweight categories (risk of overweight, overweight and obese), 21 (51.21%) were girls and 20 (48.78%) were boys.

The average waist circumference was 65.26 ± 11.53 cm in girls, and 67.41 ± 12.29 cm boys, with no significant difference between genders (Table 1). However, 28 (34.14%) students (13 boys and 15 girls) had a waist circumference greater than 71cm.

Regarding physical activity levels, we found that males presented the highest scores, with significant difference in physical exercises, in leisure score and in the total score, which clearly shows a higher level of physical activity among the boys (Table 1).

In relation to the eating habits of the schoolchildren, as shown in Table 1, we found significant difference in food intake of sweets and the number of daily meals between genders; however, girls tended to eat more sweets, while boys tended to have a higher number of daily meals. Table 2 shows the frequency distribution of food habits according to gender.

To analyse the relationship between the scores obtained on the Baecke questionnaire for anthropometric data and the food intake frequency of students, significant relationships were found between the intake of fried food, fruit and the level of physical activity (Table 3): a higher level of consumption of fried foods corresponded to less leisure activity and lower LAL and total scores. However,

Table 1 - Anthropometric data, physical activity level and food intake frequency per day of students according to gender; data expressed either as mean \pm standard deviation, or as median [interquartile range].

Parameters	Female (46)	Male (36)	p value
Weight (kg)	34.22 \pm 10.69	35.78 \pm 12.34	0.037
Height (m)	1.35 \pm 0.09	1.33 \pm 0.08	0.45
BMI (kg/m ²)	18.78 \pm 4.57	19.66 \pm 4.70	0.008
Circumference (cm)	65.26 \pm 11.53	67.41 \pm 12.29	0.085
Physical activity level (points)			
Score PEL	2.50 \pm 0.66	3.20 \pm 0.72	<0.001*
Score LAL	2.37 \pm 0.81	2.54 \pm 0.80	0.35
Score Total	4.81 \pm 1.09	5.75 \pm 1.29	<0.001*
Food intake frequency (meals/day)			
Fried food	2.00 [1.00-3.00]	2.00 [1.00-2.75]	0.48
Soda drinks	2.00 [1.75-3.00]	2.00 [1.00-3.75]	0.78
Sweets	3.00 [2.00-5.00]	2.00 [1.00-3.00]	0.01*
Fruits	4.00 [2.00-5.00]	5.00 [3.00-5.00]	0.16
Salad	3.00 [1.00-5.00]	4.00 [2.00-5.00]	0.25
Number of meals	4.00 [4.00-5.00]	5.00 [4.00-5.00]	0.01*

PEL= Physical Exercise at Leisure; LAL= Leisure Activity and Locomotion; *Significant difference.

Table 2 - Students food distribution according to frequency (meals/day) and gender. Data expressed in absolute and relative numbers

		Weekly ingestion					
		No consumption	1 Time	2 Times	3 Times	4 Times	≥ 5 Times
Fried food	M	3 (8.33%)	14 (38.89%)	10 (27.78%)	3 (8.33%)	2 (5.55%)	4 (11.12%)
	F	2 (4.34%)	18 (39.13%)	8 (17.40%)	11 (23.91%)	3 (6.52%)	4 (8.70%)
Soda drinks	M	1 (2.78%)	10 (27.78%)	11 (30.55%)	5 (13.89%)	1 (2.78%)	8 (22.22%)
	F	4 (8.70%)	7 (15.21%)	19 (41.30%)	7 (15.21)	4 (8.70%)	5 (18.87%)
Sweets	M	4 (11.12%)	9 (25%)	9 (25%)	6 (16.66%)	1 (2.78%)	7 (19.44%)
	F	1 (2.17%)	6 (13.04%)	8 (17.40%)	11 (23.91%)	5 (10.87%)	15 (32.61%)
Fruits	M	1 (2.78%)	3 (8.33%)	3 (8.33%)	4 (11.12%)	4 (11.12%)	21 (58.32%)
	F	1 (2.17%)	6 (13.04%)	11 (23.92%)	1 (2.17%)	7 (15.22%)	20 (43.48%)
Salad	M	4 (11.12%)	1 (2.78%)	5 (13.89%)	3 (8.33%)	7 (19.44%)	16 (44.44%)
	F	7 (15.22%)	5 (10.87%)	6 (13.04%)	6 (13.04%)	5 (10.87%)	17 (36.96%)
Number of daily meals			2 times	3 times	4 times	≥ 5 times	
			M	0	3 (8.33%)	14 (38.89%)	19 (52.87%)
			F	3 (6.52%)	6 (13.04%)	25 (54.35%)	12 (26.09%)

M = Male; F = Female.

Table 3 - Relationship between anthropometric data, food intake frequency and level of physical activity of students

	Score PEL		Score LAL		Total Score	
	Spearman r	p value	Spearman r	p value	Spearman r	p value
Anthropometry						
Age	0.2016	0.0694	0.02720	0.8083	0.1579	0.1566
Weight	-0.1019	0.3622	-0.06335	0.5718	-0.05945	0.5958
Height	0.06899	0.5380	0.08828	0.4303	0.1231	0.2705
BMI	-0.1828	0.1002	-0.1303	0.2433	-0.1556	0.1628
Circumference	-0.1610	0.1485	-0.1143	0.3065	-0.1568	0.1594
Food Intake Frequency						
Fried food	-0.1878	0.0910	-0.2788	0.0112*	-0.2652	0.0161*
Soda drinks	-0.06258	0.5765	-0.003186	0.9773	-0.06262	0.5763
Sweets	0.01626	0.8847	-0.1468	0.1880	-0.07980	0.4761
Fruits	0.2633	0.0168*	0.2830	0.0100*	0.3094	0.0047*
Salad	0.2015	0.0695	0.1126	0.3136	0.1908	0.0860
Number of daily meals	0.1325	0.2355	0.04904	0.6617	0.1307	0.2417

PEL = Physical Exercise of Leisure; ALL = Leisure Activity and Locomotion; *Negative correlation; **Positive correlation.

by correlating fruit intake with all of the Baecke scores, we found that a higher consumption of fruit corresponded to higher overall scores and, consequently, to a higher level of physical activity.

Regarding physical activity by the parents, we found that, out of the 82 included parents or guardians, only 29 (35.37%) practiced physical activity weekly, most of them hiking once or twice a week for 30 to 60 minutes.

A comparison of the frequency and composition of meals of children compared to their parents showed that the children consumed significantly more soda, fried foods,

sweets and fruit, as well as presenting with a significantly greater number of meals per day. No difference was found for the relationship between parents and children for the consumption of salad (Table 4).

In terms of the health of the parents, 17 (20.73%) presented with cardiovascular disease; among these, four (23.53%) had diabetes, eight (47.05%) had hypertension, three (17.64%) had high cholesterol, one (5.88%) had cardiac arrhythmia, and one (5.88%) presented with varicose veins.

Table 4 - Comparison of food intake frequency between students and parents

Food Intake Frequency	Parents	Students	p value
Fried food	1.00 [0.00-2.00]	2.00 [1.00-3.00]	0.0009*
Soda drinks	2.00 [1.00-3.00]	2.00 [1.00-3.00]	0.0132*
Sweets	2.00 [1.00-3.00]	3.00 [1.75-5.00]	0.0006*
Fruits	3.00 [2.00-4.00]	4.50 [2.00-5.00]	0.0033*
Salad	4.00 [3.00-5.00]	4.00 [2.00-5.00]	0.5783
Number of daily meals	3.50 [3.00-4.00]	4.00 [4.00-5.00]	<0.0001*

*Significant difference (p < 0.05)

DISCUSSION

In this study, we found the expected higher values for weight and BMI in male students. However, half of the sample (41 children) showed excessive weight for their age (ranking as at risk for being overweight, being overweight or obese); of these, 21 were girls and 20 were boys.

In a study by Ricardo et al.,¹⁹ children were evaluated with the purpose of analysing the relationship between BMI and other parameters, between genders of public and private schools, aged six to 10 years. It was found that the average male BMI was $17.4 \pm 2\text{kg/m}^2$ and the average female BMI was $17.2 \pm 2\text{kg/m}^2$; these values were lower than those found in this study. In the Ricardo et al. study,¹⁹ 14.9% of boys and 15.9% of girls were found to be overweight, and 6.7% and 5.5% were obese, respectively.

The findings of this study about the percentage of overweight individuals are similar to those found in the study of Castilho et al.,²⁰ which assessed children and teenagers: they reported that 43.5% of children and 33.8% of teenagers showed as overweight or obese, and that most (37.5%) were male.

In this research, no difference was seen in the average waist circumference between genders (boys: $67.41 \pm 12.29\text{cm}$ and girls $65.26 \pm 11.53\text{cm}$), but these values were higher than those found in the study of Damasceno et al.,²¹ that aimed to relate BMI to abdominal circumference and to determine the prevalence of being overweight. They reported that 27.6% of females and 26.8% of males presented an abdominal circumference ≥ 59.2 , a normally accepted cutoff point for central obesity. Obesity was found in 6.6% of the sample, being overweight in 15.3%. Overweight values were higher in males. The authors also emphasized that, even though there is a strong correlation between BMI and abdominal circumference, not all the individuals with a high BMI will also exhibit a large abdominal circumference.

In this study, 28 (34%) students (13 boys and 15 girls) showed abdominal circumference values in excess of 71cm; according to the Brazilian Guidelines for Obesity,²² this represents a cardiovascular risk for these individuals.

The boys evaluated in this research presented with a higher level of physical activity compared to the girls,

evidenced by their higher scores for PEL and by their total scores. These findings corroborate those of Matias et al.,²³ who evaluated 216 adolescents, aged 13 to 19. It is interesting to note that Matias et al. found these similar results using a different instrument for their analysis, namely the Questionnaire of Usual Physical Activity, which classifies individuals as inactive, moderately active, active, and very active.

As far as eating habits are concerned, the assessed students reported the frequent inclusion of fruit and salads in their diets, items described as healthy foods; however, they also reported the relatively frequent consumption of foods considered to be unhealthy, such as sweets, fried foods and soda drinks, which is a possible justification for the presence of excess weight in this sample.

When comparing the difference in eating habits between the genders, we found that the girls consume a higher amounts of sweets, while the boys eat more meals per day. A report by Enes et al.²⁴ claims that girls have healthier eating habits when compared to boys, a finding not confirmed in our study. In addition, these authors also reported that inappropriate eating habits, such as the insufficient consumption of fruit and vegetables, are factors contributing to weight gain. Nunes et al.²⁵ evaluated 588 adolescents (aged 12.8 ± 1.8 years) and reported the prevalence of unhealthy eating habits, such as consumption of soft drinks, sweets and snacks, in addition to the low consumption levels of fruit.

We found a negative correlation between the level of physical activity and the consumption of fried foods, and a positive correlation with consumption of fruit, which indicates that individuals who perform exercises tend to eat healthier food.

Regarding the parents of the students evaluated, only 29 (35.36%) practiced physical activities on a weekly basis, most of which was once or twice a week, and was hiking. That fact that only a few parents were physically active can be linked to the high number of students who had excess weight, according to Perez-Shepherd et al.,²⁶ sons of obese parents have a six fold higher risk of developing obesity, for daughters of obese mothers, the risk increases tenfold.

The presence of cardiovascular diseases, such as diabetes, hypertension, arrhythmia, varicose veins, and high

cholesterol, seen in 20.73% of the parents of the students in this study, can be indicative of the risk of the emergence of these future changes in the children, especially in the overweight children. This risk was also stated by Ricardo et al.,¹⁹ who described the association of high levels of body fat with the development of chronic diseases, such as obesity, hypertension, diabetes and cardiovascular diseases.

■ CONCLUSION

Excess weight has been found in half of the students evaluated in a small town with a high Human Development Index. It was also found that boys presented higher level of physical activity, number of meals and lower sweet intake. Furthermore, it was observed that better eating habits were associated with the level of physical activity.

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■ COMPETING INTERESTS

None declared.

■ AUTHORS' CONTRIBUTIONS

M T P structured the script and directed the work; T A C A held the data collection and organised the data; L M S held the data collection and organised the data; D C G LF structured the method and data analysis; T M structured the discussion and conclusion; T D S performed the data analysis and set up the work of the results; B C B adapted the work for the English language; P C F F helped in the construction of the discussion; C B M M has reviewed and general organised the manuscript.

PERFIL ANTROPOMÉTRICO, HÁBITOS ALIMENTARES E NÍVEIS DE ATIVIDADE FÍSICA DE ESTUDANTES NUMA CIDADE DO ESTADO DE SÃO PAULO

OBJETIVO: o objetivo deste estudo foi verificar a prevalência de pessoas com excesso de peso, e relacionar hábitos alimentares e níveis de atividade física em escolares de 7 a 13 anos de escolas públicas de uma cidade de São Paulo, e comparar os hábitos alimentares e níveis de atividade física dos alunos com seus pais.

TIPO DE ESTUDO: Esta pesquisa é do tipo transversal de caráter observacional.

MÉTODO: Oitenta e duas crianças de ambos os sexos, com idade de 07 a 13, foram avaliadas, dados antropométricos

foram recolhidos e índice de massa corpórea por idade foi classificada pelo SISVAN, juntamente com a aplicação de um questionário para análise dos níveis de atividade física e perfis alimentares dos estudantes e dos pais.

RESULTADOS: A análise dos dados foi realizada com os testes de Kolmogorov-Smirnov, teste-t pareado e Mann Whitney; para a análise de correlação, os testes de Spearman ou de Pearson foram realizadas. Adotou-se nível de significância de 5%. Neste estudo, metade dos estudantes tinham excesso de peso e apresentavam a circunferência abdominal aumentada. Observou-se também que melhores hábitos alimentares associavam-se a maior nível de atividade física. Os estudantes consumiam mais alimentos fritos, doces e frutas, além de se alimentarem em maior quantidade do que seus pais; dentre estes, poucos realizavam atividade física regular.

CONCLUSÕES: O excesso de peso foi encontrado em metade dos alunos avaliados numa pequena cidade com alto Índice de Desenvolvimento Humano. Verificou-se também que os meninos apresentaram maior nível de atividade física, número de refeições e menor ingestão de doces. Além disso, observou-se que os melhores hábitos alimentares estavam associados ao nível de atividade física.

PALAVRAS-CHAVE: sobrepeso, obesidade, exercício, comportamento alimentar, criança.

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