Anthropometric and body composition parameters to predict body fat percentage and lipid profile in schoolchildren

Parâmetros antropométricos e de composição corporal na predição do percentual de gordura e perfil lipídico em escolares

Parámetros antropométricos y de composición corporal en la predicción del porcentaje de grasa y perfil lipídico en escolares

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ABSTRACT

Objective: To evaluate the efficacy of anthropometric and body composition parameters in the prediction of body fat percentage and lipid profile in schoolchildren.

Methods: Cross-sectional study with 209 schoolchildren aged between seven and nine years old. The following variables were evaluated: weight, height, body mass index, percentage of body fat, arm and waist circumferences, conicity index, waist-to-height ratio, waist-to-hip ratio, total cholesterol, triglycerides, and high and low density lipoproteins. Statistic treatment included the use of Kolmogorov-Smirnov, Student's *t* and Mann-Whitney tests, and Spearman and Pearson's correlations. Receiver Operating Characteristic curves were used to identify the predictors of elevated body fat percentage and lipid alterations.

Results: Body fat percentage was the variable with the largest number of correlations, especially with weight, body mass index, and arm circumference in both genders, and with waist circumference and waist-to-hip ratio among males. Body mass index, arm and waist circumferences in both genders and waist-to-hip ratio for males showed good discriminatory power for predicting high body fat percentage. Anthropometric and body composition parameters were not able to predict lipid profile alterations, except for body fat percentage, arm and waist circumferences and waist-to-hip ratio, which were good predictors of triglycerides alterations in males.

Conclusions: Dyslipidemia could not be predicted by anthropometric and body composition measurements in children, especially among females, suggesting the need for investigating lipid profile by laboratorial exams.

Key-words: child; dyslipidemias; anthropometry; body composition.

RESUMO

Objetivo: Avaliar a eficácia de indicadores antropométricos e da composição corporal na predição do percentual de gordura e perfil lipídico em escolares.

Métodos: Estudo transversal envolvendo 209 escolares entre sete e nove anos. Foram consideradas as seguintes variáveis: peso, estatura, índice de massa corporal, percentual de gordura corporal, circunferências do braço e cintura, índice de conicidade, razão cintura/estatura, razão cintura/quadril, colesterol total, triglicerídeos e lipoproteínas de alta e baixa densidades. O tratamento estatístico incluiu a utilização dos testes de Kolmogorov-Smirnov, *t* de Student, Mann-Whitney e a correlação de Pearson e Spearman. Para identificação dos preditores do elevado percentual de gordura corporal e das alterações lipídicas, adotou-se a análise da *Receiver Operating Characteristic Curve*.

Resultados: O percentual de gordura corporal foi a variável que apresentou maior número de correlações, correlacionando-se fortemente com peso, índice de massa corporal e circunferência do braço em ambos os gêneros, além de

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apresentar fortes correlações com a circunferência da cintura e a razão cintura/estatura nos meninos. O índice de massa corporal, as circunferências do braço e da cintura em ambos os gêneros e a razão cintura/quadril para o sexo masculino apresentaram poder discriminatório satisfatório para predição do percentual de gordura corporal elevado. Os parâmetros antropométricos e de composição corporal não foram capazes de predizer alterações no perfil lipídico, com exceção do percentual de gordura corporal, da circunferência do braço e cintura e da razão cintura/quadril, que se mostraram bons preditores de alterações de triglicerídeos no gênero masculino.

Conclusões: A dislipidemia não pôde ser predita por medidas antropométricas e de composição corporal na faixa etária pediátrica, especialmente no gênero feminino, sugerindo a necessidade da investigação do perfil lipídico por meio de exames laboratoriais.

Palavras-chave: criança; dislipidemias; antropometria; composição corporal.

RESUMEN

Objetivo: Evaluar la eficacia de indicadores antropométricos y de composición corporal en la predicción del porcentaje de grasa y perfil lipídico en escolares.

Métodos: Estudio transversal implicando a 209 escolares entre siete y nueve años. Se consideraron las variables a continuación: peso, estatura, índice de masa corporal (IMC), porcentaje de grasa corporal (%GC), circunferencia del brazo (CB) y cintura (CC), índice de conicidad (IC), razón cintura/estatura (RCE), razón cintura/cadera (RCC), colesterol total (CT), triglicéridos (TG) y lipoproteínas de alta (HDL) y baja densidad (LDL). El tratamiento estadístico incluyó la utilización de las pruebas de Kolmogorov-Smirnov, prueba t de Student, Mann Whitney y correlación de Pearson y Spearman. Para identificar los predictores del elevado %GC y de las alteraciones lipídicas, se adoptó el análisis de las curvas Receiver Operating Characteristics (ROC).

Resultados: El %GC fue la variable que presentó mayor número de correlaciones, correlacionándose fuertemente con peso, IMC y CB en ambos géneros, además de presentar fuertes correlaciones con CC y RCE en los niños. El IMC, CB y CC en ambos géneros y la RCC para el masculino presentaron poder discriminatorio satisfactorio para predicción del %GC elevado. Los parámetros antropométricos y de composición corporal no fueron capaces de predecir alteraciones en el perfil lipídico, con excepción del %GC, CB y RCC que se mostraron buenos predictores de alteraciones de TG en el género masculino.

Conclusión: No se pudo predecir la dislipidemia por medidas antropométricas y de composición corporal en la franja de edad pediátrica, especialmente en el género femenino, sugiriendo la necesidad de la investigación del perfil lipídico por medio de exámenes laboratoriales.

Palabras clave: niño; dislipidemias; antropometría; composición corporal.

Introduction

As cardiovascular diseases have progressively advanced among children[1], greater attention should be paid to the identification of risk factors in this age group. In the 5- to 9-year-old population, about half of the children were overweight according to the Brazilian Expenditure and Income Survey (*Pesquisa de Orçamentos Familiares*, POF, 2008-2009). Overweight was found in 33.5% of the children, and obesity already affected 14.3%[2].

Among adults, the role of obesity and abdominal fat have been clearly established as factors that determine cardiovascular risk[3]. Among children, however, further studies should be conducted, because of the relevance of this issue and the fact that several authors have reported contradictory results[4-7]. Dyslipidemias are the major risk factor for coronary heart disease, the main cause of death in Brazil[8]. Although signs and symptoms usually appear only in adulthood, their silent onset occurs in childhood, and the disease progresses as individuals grow older[9].

Laboratory tests to assess lipid profile are not routinely requested for children, but easy-to-obtain data, such as anthropometric measurements, may prove to be useful as screening tools in clinical practice. This study evaluated the efficacy of anthropometric and body composition parameters in the prediction of body fat and lipid profile in schoolchildren.

Methods

This cross-sectional study enrolled children attending public and private schools in the urban area of the city of Diamantina (13 schools: 10 public and three private), in the Vale do Jequitinhonha, state of Minas Gerais, Brazil. A total of 209 children (126 girls) aged seven to nine years were included. This study was part of a larger investigation, Gestation and birth characteristics and feeding in the first year of life and their association with dyslipidemia and overweight in schoolchildren[10], approved by the Committee on Ethics in Research with Human Beings of Universidade de Viçosa, under number 040/2009. This larger study was designed to investigate the association between breastfeeding and obesity and dyslipidemia in schoolchildren.

To calculate sample size, the maximum expected frequency of overweight in the age group under study was assumed to be 10%, based on municipal data and previous studies[11,12], and the confidence interval was set at 95%. The minimum sample size was 150 children.

To select participants, all classrooms with students in the age group of interest in all schools were enrolled for random drawing. The number of students randomly drawn in each school was proportional to the total number of students enrolled in each school. Children included in the study lived in the urban area, did not have any chronic diseases nor made use of medications for chronic diseases, had not had diarrhea (defined as more than three episodes of watery stools per day on at least three days) one week before the interview and had no medical condition that might affect growth (diabetes, juvenile rheumatoid arthritis, inflammatory bowel disease, cerebral palsy, Down syndrome, leukemia, orthopedic conditions, congenital anomalies).

Data were collected from August 2008 to February 2009 in classes that meet in the morning and in the afternoon by a properly trained dietician, who was also responsible for the study. The anthropometric variables under study were: weight, height, triceps and subscapular skin folds, and waist, hip and arm circumferences. Blood samples were collected to measure total cholesterol (TC), triglycerides (TG) and low and high density lipoproteins (LDL and HDL).

Weight was measured using a 136-kg weighing scale to the nearest 0.1kg, and children were asked to take off shoes and accessories. At the same time, height was measured using a 200-cm stadiometer to the nearest 0.5cm while the child was standing without shoes. After weight and height were measured, body mass index (BMI) was calculated to classify children according to nutritional status using the 2007 World Health Organization (WHO) criteria[13]. The cut-off point for overweight was a Z score equal to or greater than +1.

Triceps and subscapular skin folds were measured in the right side of the body using a Lange skinfold caliper. Each measurement was made three times, and the final result was the mean of the two closest values. The triceps skinfold was measured in the posterior area of the right arm, over the triceps, at the midpoint between the acromion and olecranon, and the subscapular fold was measured immediately below and away from the angle of the right scapula[14]. The percentage of body fat in children was estimated using the equations described by Slaughter *et al*[15], derived from a multicomponent model and adjusted for sex, maturation level and ethnicity. These equations used the values of the triceps and subscapular skinfolds. Excessive body fat was diagnosed according to the body fat thresholds defined by Lohman[16]: more than 20% for boys and 25% for girls.

Waist, hip and arm circumferences were measured using a flexible and inelastic measuring tape. Waist circumference was measured at the midpoint between the costal margin and the iliac crest and the hip, around the maximum circumference of the buttocks. The arm circumference was measured while the child was standing. First the right forearm was raised to form a 90 degree angle with the upper arm, and the measurement was made at the midpoint between the lateral region of the acromion and olecranon. Waist circumference (WC) was classified according to the cut-off points suggested by Taylor *et al*[17], which define that WC is elevated when ≥62 and 62.9cm at 7 years, 64.7 and 65.3cm at 8 years and 67.3 and 67.7cm at 9 years for boys and girls[17].

The waist-to-hip ratio (WHR) was calculated by dividing WC by hip circumference (HC). The waist-to-height ratio (WHeR) was calculated by dividing WC (cm) by height (cm). The conicity index (CI) was calculated using WC, weight and height, according to the equation below:

$$\text{Conicity index} = \text{weist circunference (m)} \div 0.109\sqrt{\frac{\text{weight (kg)}}{\text{height (m)}}}$$

Blood samples to assess lipid profiles were collected in the morning after 24-hour fasting by venous puncture and using disposable materials in a municipal reference laboratory. Plasma triglycerides (TG), total cholesterol (TC) and HDL were measured using colorimetric assays. LDL was calculated using the Friedwald equation[18]. Lipid profile was classified according to the First Brazilian Guidelines for the Prevention of Atherosclerosis in Childhood and Adolescence[1].

The SPSS 11.0 was used for data analysis. The level of significance was set at 5% ($p<0.05$). The Kolmogorov-Smirnov test was used to define variable distribution; if distribution was normal, the Student *t* test and the Pearson correlation coefficient were used; otherwise, the Mann Whitney test and the Spearman correlation coefficient were calculated. Correlations were interpreted according to the classification described by Callegari-Jacques[19]. Receiver operating characteristics (ROC) curves were built, and the area under the curve was calculated, at a 95% confidence interval.

Children were only examined after the informed consent term was signed by their parents or guardians.

Results

A total of 209 schoolchildren (girls: 60.3%) were evaluated. The analysis of nutritional status revealed that 7.5% (n=16) were underweight, weight was normal in 72.2% (n=151), and 20.1% (n=42) were overweight. The most frequent abnormal values in lipid profile were found for TC (60.6%), LDL (32.1%), HDL (25.5%) and TG (8.5%). The percentage of body fat (%BF) was above the limit recommended by Lohman[16] in 32.4% of the schoolchildren.

The characteristics of the schoolchildren included in the study are described in Table 1. Mean BMI and median WC, CI, WHeR and WHR were higher for boys, whereas girls had higher %BF.

The variable with the greatest number of correlations with the other anthropometric and body composition parameters was %BF, which was also strongly correlated with weight, BMI, AC for both boys and girls and with AC and WHeR for boys. TC was positively correlated only with %BF, whereas HDL was negatively correlated with WHR in both boys and girls. The correlation between lipid profile (TC, TG and HDL) and the anthropometric and body composition parameters was weak. The plasma levels of LDL in both boys and girls were not correlated with any of the variables under analysis (Table 2).

Figures 1 and 2 show the areas under the ROC curves for WHeR, WHR, BMI, CI, AC and WC as predictors of high %BF, TC, TG and LDL and low HDL in boys and girls.

BMI, AC and WC in both sexes and WHR in boys were good predictors of elevated %BF. In general, anthropometric and body composition parameters did not predict lipid profile alterations, except %BF, AC, WC and WHR, which were good predictors of alterations in triglycerides in boys (Table 3).

Table 1 - Age, anthropometric and body composition parameters and lipid profile according to sex. Diamantina, Brazil, 2009

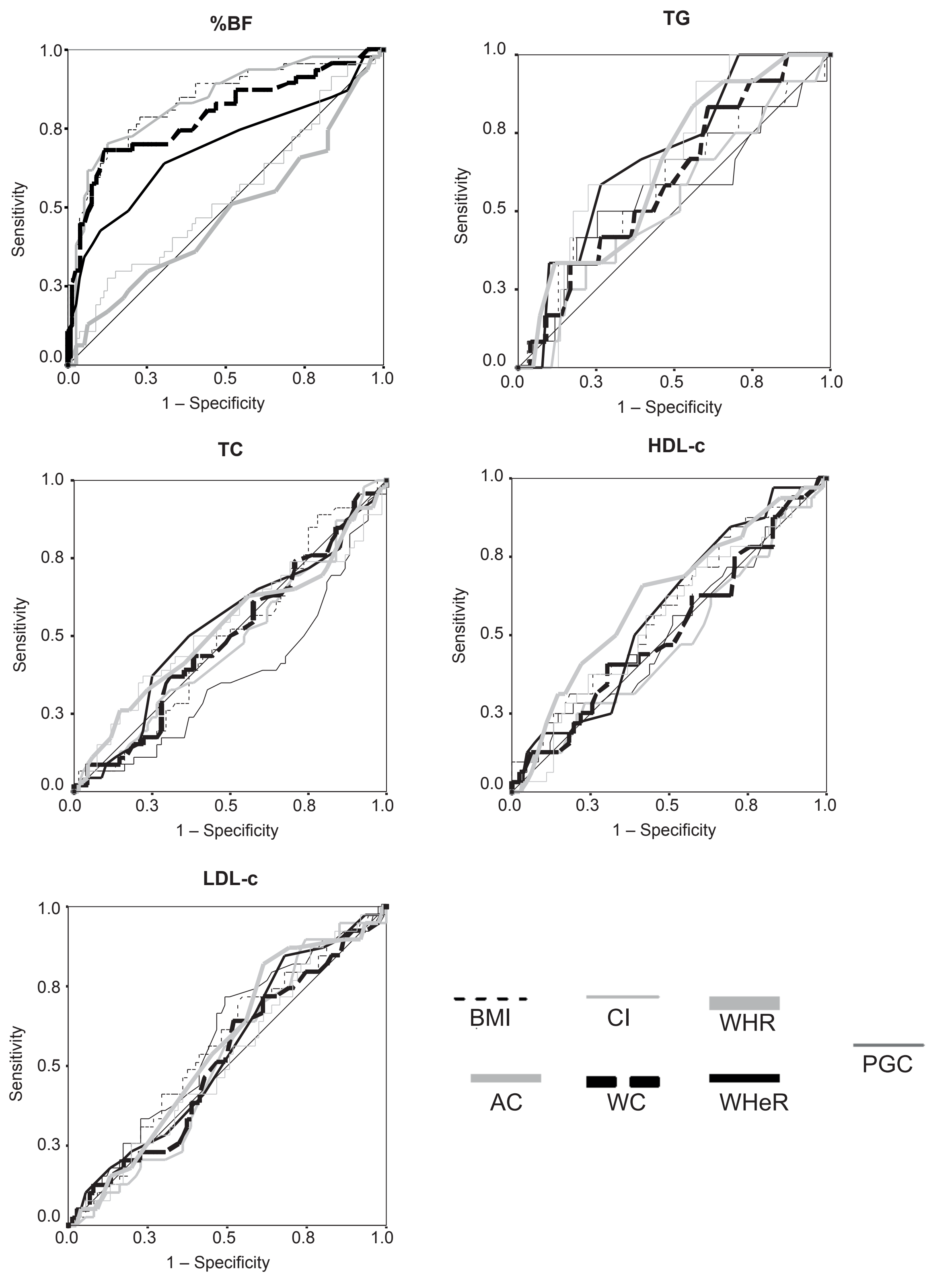
Variables	Girls		Boys		*p*-value
	Mean±SD	Md (min–max)	Mean±SD	Md (min–max)	
Age (years)	8.1±0.8	8.0 (7.0–9.0)	8.1±0.7	8.0 (7.0–9.0)	0.69
Weight (kg)	28.1±5.8	27.2 (16.5–44.2)	29.6±6.3	29.2 (19.6–52.1)	0.07
Height (cm)	130.8±7.7	131.6(109.2–153.1)	131.1±6.6	131.4(114.9–142.6)	0.79
BMI (Kg/m^2)	16.4±2.2	15.8 (12.8–25.4)	17.2±2.9	16.5 (13.9–31.6)	0.02
%BF	23.9±8.8	23.6 (4.0–46.8)	18.1±7.5	16.5 (8.4–49.4)	<0.001
AC	20.6±4.2	20.0 (15.0–55.5)	20.6±3.0	20.0 (16.0–31.0)	0.98
WC	57.1±6.7	55.8 (15.9–79.5)	59.7±6.8	57.5 (46.5–88.0)	<0.001
CI	1.1±0.1	1.1 (0.4–1.4)	1.2±0.1	1.2 (1.0–1.4)	0.01
WHeR	0.4±0.0	0.4 (0.2–0.6)	0.5±0.0	0.4 (0.4–0.7)	<0.001
WHR	0.8±0.1	0.8 (0.3–1.0)	0.9±0.0	0.9 (0.7–1.1)	<0.001
TC	156.7±24.8	154.0 (113.0–242.0)	154.9±21.6	154.0 (115.0–221.0)	0.61
TG	65.9±28.4	60.0 (23.0–231.0)	64.6±31.7	58.0 (26.0–186.0)	0.76
HDL	52.0±10.3	52.0 (30.0–76.0)	52.3±10.0	52.0 (29.0–74.0)	0.85
LDL	91.6±26.3	88.5 (42.0–185.0)	90.1±21.9	87.0 (52.0–149.0)	0.68

Md: Median; min: minimum; max: maximum; SD: standard deviation; BMI: body mass index; %BF: percentage body fat; AC: Arm circumference; WC: Waist circumference; CI: Conicity index; WHeR: waist-to-height ratio; WHR: waist-to-hip ratio; TC: Total cholesterol; TG: triglycerides; HDL: High density lipoprotein; LDL: Low density lipoprotein;

Table 2 - Correlations between anthropometric and body composition parameters with lipid profile variables among schoolchildren. Diamantina, Brazil, 2009

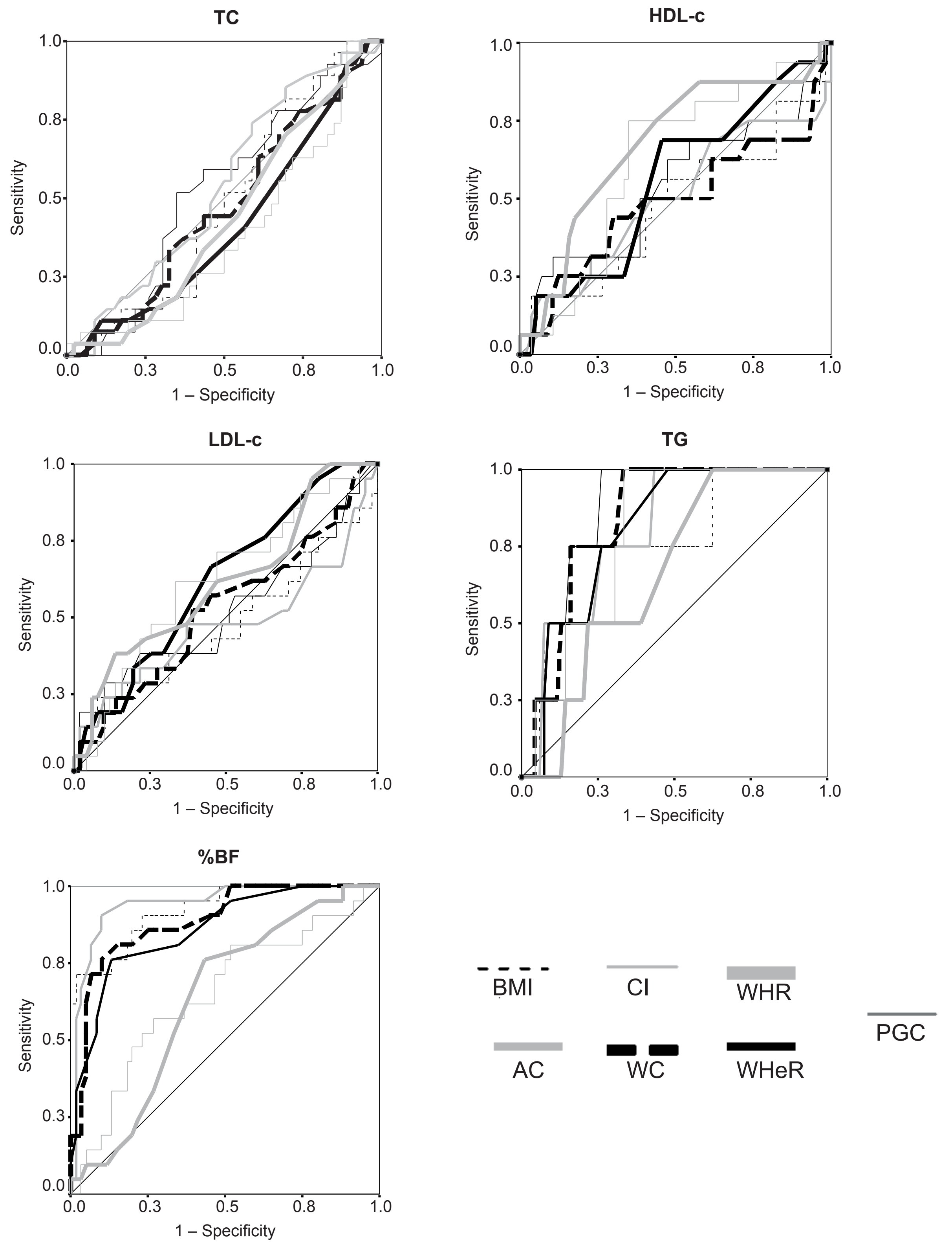
Variables	Girls (n=126)					Boys (n=83)				
	% BF	TC	TG	LDL	HDL	% BF	TC	TG	LDL	HDL
Weight	0.64**	0.00	0.20	-0.03	-0.01	0.78**	0.12	0.21	0.01	0.05
Height	0.43**	- 0.02	0.05	-0.04	0.07	0.28**	- 0.06	0.07	-0.13	0.10
BMI	0.68**	0.02	0.27**	0.00	-0.08	0.88**	0.20	0.26*	0.09	-0.01
%BF	1	0.20*	0.26**	0.12	0.06	1	0.27*	0.30**	0.20	0.05
AC	0.63**	-0.11	0.01	-0.17	0.15	0.84**	0.15	0.24*	0.03	0.02
WC	0.53**	0.01	0.23**	-0.04	0.03	0.79**	0.19	-0.02	0.09	-0.02
CI	0.04	- 0.01	-0.08	-0.01	-0.08	0.2*	0.15	-0.12	0.13	-0.12
WHeR	0.32**	0.02	-0.08	-0.02	-0.08	0.74**	0.25*	-0.08	0.17	-0.08
WHR	- 0.03	- 0.02	0.24**	0.03	-0.22*	0.20	0.13	0.24*	0.19	-0.24*

*$p<0.05$ ** $p<0.01$; BMI: body mass index; %BF: percentage body fat; AC: Arm circumference; WC: Waist circumference; CI: Conicity index; WHeR: waist-to-height ratio; WHR: waist-to-hip ratio; TC: Total cholesterol; TG: triglycerides; HDL: High density lipoprotein; LDL: Low density lipoprotein



%BF: percentage of body fat; TC: total cholesterol; TG: Triglycerides; LDL-c: low density lipoprotein; HDL-c: high density lipoprotein; CI: conicity index; WHR: Waist-to-hip ratio; WC: Waist circumference; BMI: body mass index; WHeR; Waist-to-height ratio; AC: arm circumference.

Figure 1 - ROC curve for anthropometric and body composition parameters in the evaluation of percentage of body fat and lipid profiles in female schoolchildren. Diamantina, Brazil, 2009



%BF: percentage of body fat; TC: total cholesterol; TG: Triglycerides; LDL-c: low density lipoprotein; HDL-c: high density lipoprotein; CI: conicity index; WHR: Waist-to-hip ratio; WC: Waist circumference; BMI: body mass index; WHeR; Waist-to-height ratio; AC: arm circumference

Figure 2 - ROC curve for anthropometric and body composition parameters in the evaluation of percentage of body fat and lipid profiles in male schoolchildren. Diamantina, Brazil, 2009

The evaluation of the most accurate cut-off points revealed that %BF and WC reached the highest sensitivity and specificity when using 18.99% and 63.2cm as cut-off points. The efficacy of these two parameters was higher in detecting alterations in triglycerides in boys and resulted in fewer false positive and false negative results.

Discussion

The nutritional status was altered in 27.8% of the schoolchildren, and most were overweight (20.1%). Children in this age group followed the nutritional changes seen in Brazil: nutritional deficits concurrent with alterations due to

Table 3 - Area under the ROC (AUROC) curve of anthropometric and body composition parameters in predicting elevated percentage of body fat and lipid profile alterations in schoolchildren. Diamantina, Brazil, 2009

Variables	Girls			Boys		
	AUC	95%CI	*p*-value	AUC	95%CI	*p*-value
%BF						
BMI	0.84	0.76–0.91	< 0.01	0.92	0.86–0.99	<0.01
AC	0.84	0.76–0.91	< 0.01	0.89	0.80–0.97	<0.01
WC	0.79	0.70–0.88	< 0.01	0.94	0.89–0.99	<0.01
CI	0.54	0.43–0.64	0.50	0.64	0.51–0.76	0.06
WHeR	0.68	0.58–0.79	< 0.01	0.65	0.51–0.79	0.04
WHR	0.48	0.37–0.59	0.05	0.86	0.77–0.95	<0.01
TC						
%BF	0.37	0.26–0.47	0.02	0.52	387– 659	0.74
BMI	0.45	0.34–0.60	0.92	0.50	0.37–0.63	0.99
AC	0.48	0.37–0.59	0.70	0.49	0.35–0.62	0.87
WC	0.45	0.39–0.60	0.92	0.55	0.42–0.69	0.43
CI	0.53	0.41–0.64	0.62	0.44	0.31–0.57	0.40
WHeR	0.53	0.42–0.64	0.62	0.40	0.27–0.54	0.16
WHR	0.06	0.41–0.64	0.66	0.44	0.30–0.57	0.36
TG						
%BF	0.55	0.35–0.74	0.56	0.84	0.74–0.94	0.02
BMI	0.59	0.41–0.77	0.32	0.76	0.53–0.99	0.08
AC	0.53	0.36–0.70	0.76	0.83	0.70–0.95	0.03
WC	0.60	0.44–0.75	0.26	0.79	0.62–0.95	0.05
CI	0.68	0.54–0.81	0.05	0.66	0.47–0.87	0.28
WHeR	0.68	0.54–0.82	0.04	0.79	0.64–0.93	0.06
WHR	0.64	0.50–0.79	0.11	0.79	0.63–0.94	0.05
LDL						
%BF	0.57	0.46–0.68	0.17	0.52	0.35–0.68	0.08
BMI	0.56	0.45–0.67	0.32	0.47	0.31–0.63	0.71
AC	0.51	0.40–0.62	0.79	0.52	0.37–0.67	0.79
WC	0.52	0.40–0.62	0.82	0.47	0.30–0.63	0.66
CI	0.52	0.41–0.63	0.75	0.61	0.46–0.76	0.13
WHeR	0.54	0.43–0.65	0.46	0.61	0.47–0.76	0.13
WHR	0.56	0.45–0.67	0.32	0.61	0.47–0.75	0.14
HDL						
%BF	0.51	0.39–0.63	0.88	0.53	0.36–0.71	0.85
BMI	0.58	0.46–0.70	0.18	0.47	0.30–0.64	0.71
AC	0.48	0.36–0.60	0.69	0.49	0.32–0.63	0.67
WC	0.51	0.39–0.63	0.83	0. 47	0.30–0.66	0.79
CI	0.55	0.43–0.66	0.44	0.61	0.46–0.76	0.03
WHeR	0.57	0.46–0.67	0.22	0.54	0.39–0.70	0.18
WHR	0.62	0.50–0.73	0.05	0.67	0.52–0.83	0.59

AUC: Area under the ROC curve; CI: confidence interval; %BF: percentage of body fat; BMI: body mass index; AC: arm circumference; WC: Waist circumference; CI: conicity index; WHeR: Waist-to-height ratio; WHR: Waist-to-hip ratio overweight[20]. Our results suggest that interventions should be conducted, as overweight in childhood and adolescence is correlated with risk factors of diseases at this age[21,22] and later in life[23,24]. Moreover, when onset occurs in the beginning of life, the disease tends to be permanent or to worsen as age advances[25]. The prevalence of lipid profile changes was high among the children in this study, as well as in studies conducted in other Brazilian regions, such as in the cities of Florianópolis[4] and Belém[7].

These results indicate a high risk of coronary heart disease in a group of still very young individuals. One of the possible explanations for the growing prevalence of dyslipidemia among children may be the changes in eating habits and in the level of physical activities that the Brazilian population has experienced in the last years[26]. Current life styles favor the consumption of industrialized foods, often greasier and nutritionally poorer, eating snacks and restaurant meals instead of eating at home, and consuming foods that have more calories and less fiber. In addition, modern life amenities, such as elevators and escalators, remote controls and cars, as well as the new forms of entertainment enjoyed by children, such as computers and videogames, promote a sedentary life style[6].

Classically, dyslipidemia is one of the major risk factors for several cerebrovascular events, such as atherosclerosis, myocardial infarction and stroke. For that reason, the Brazilian Association of Cardiology (*Sociedade Brasileira de Cardiologia* — SBC) recommends that prevention and treatment should begin as early as in childhood[1], when atherosclerotic events, although silent, begin to develop[9].

The diagnosis of dyslipidemia in childhood has received special attention due to the importance of early detection and treatment of this disease. In routine pediatric practice, however, blood tests to assess lipid profiles are not requested, although recommended by the SBC whenever the child has any risk factor[1]. In our study, however, classical risk factors of dyslipidemia in adults, such as high percentage of body fat, overweight or obesity and elevated waist circumference, were not good predictors of dyslipidemia in children. That is, children that did not have risk factors for this disease may have serum lipid and lipoprotein changes and yet go undiagnosed.

In this study, the level of triglycerides was the lipid variable correlated with most anthropometric parameters. In agreement with the correlation analyses and as demonstrated by the ROC curves, only serum levels of triglycerides were predicted by anthropometric parameters for boys, as the percentage of body fat, the waist and arm circumferences and the waist-to-hip ratio had the largest areas under the ROC curve for triglycerides.

Therefore, in addition to evaluating fat mass, fat distribution should also be analyzed. Abdominal fat, in addition to being an important predictor of an increase in the level of triglycerides, is associated with a decrease in HDL levels and an increase in left ventricular mass in children and adolescents[27].

The cut-off point of 18.99% for body fat suggested in this study for predicting hypertriglyceridemia in boys is below the reference value, that is, even boys with a percentage of body fat classified as adequate by Lohman[16] may already have alterations in their levels of serum triglycerides. The cut-off point for waist circumference seems to be very close to that suggested for 7-year-old children. However, waist circumference increases gradually with age, and it is clearly necessary to adjust the cut-off to age for a better prediction of triglyceride levels in boys.

The anthropometric parameters used in this study were also evaluated as predictors of level of serum lipids by other authors, who found similar results[28]. Among older children and adolescents, the associations between anthropometric parameters and lipid profile are more evident[5,7,29], although some results are contradictory[6].

Because of the lack of agreement between results, other investigations should evaluate the efficacy of anthropometric parameters in predicting lipid profiles in children, so that the diagnosis of this disorder may be established as early as possible, as about 50% of the children with elevated TC and LDL levels remain like that for 10 to 15 years (tracking)[30,31].

Nevertheless, this study demonstrated that, in the age group under study, anthropometric and body composition parameters did not predict dyslipidemia, particularly not among girls, except for hypertriglyceridemia alone, which was accurately predicted by percentage of body fat in both sexes and waist circumference in boys. The assessment of lipid profiles using laboratory tests should be routine for this age group because of the high prevalence of serum lipid alterations found in our study and their serious consequences to public health.

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