Revista Cuidarte
http://dx.doi.org/10.15649/cuidarte.v9i3.575

Open Access

RESEARCH ARTICLE

Childhood Obesity: an anthropometric, biochemical, alimentary and lifestyle analysis

Obesidade Infantil: análises antropométricas, bioquímicas, alimentares e estilo de vida

Obesidad Infantil: análisis antropométricos, bioquímicos, alimenticios y de estilo de vida

Ana Carolina Teixeira Paiva[1], Crislaine Campagnoli do Couto[2], Adriano Pinheiro de Lemos Masson[3], Cristiane Aparecida Silveira Monteiro[4], Cristiane Fonseca Freitas[5]

Historic

Receipt date:
June 15th, 2018
Approval date:
August 10th, 2018

1 *BA Nursing at the Pontifical Catholic University of Minas Gerais. Belo Horizonte, Brazil. Email address: anacaroltpaiva@gmail.com https://orcid.org/0000-0002-2795-0933*
2 *BA Nursing at the Pontifical Catholic University of Minas Gerais. Belo Horizonte, Brazil. Email address: crislainecampagnoli@gmail.com https://orcid.org/0000-0002-1779-1000*
3 *MD at the Federal University of Triângulo Mineiro. Endocrinology Specialist. Brazil. Email address: consultorio502@gmail.com https://orcid.org/0000-0002-4960-3326*
4 *PhD Nursing at the Ribeirão Preto School of Nursing, University of São Paulo. Associate Professor IV level at the Pontifical Catholic University of Minas Gerais, Poços de Caldas campus. Brazil. Email address: casilve@yahoo.com.br https://orcid.org/0000-0002-8427-7220*
5 *PhD Pharmacology at State University of Campinas. Associate Professor IV level at the Pontifical Catholic University of Minas Gerais. Belo Horizonte, Brazil. Corresponding Author. Email address: cristianefonseca@hotmail.com http://orcid.org/0000-0001-6198-366X*

Abstract

Introduction: Inadequate eating habits in childhood predispose to the onset of metabolic diseases in adulthood. Therefore, this study aims to identify BMI changes in students of the municipality of Poços de Caldas-MGBR, aged 6 to 12 years, as well as to evaluate biochemical analysis, anthropometric data, and eating patterns. **Material and Methods:** A quantitative field study was conducted in three schools, one public and two private, in the period 2015-2016, with a sample of 104 children. The variables of interest were anthropometric data, blood sampling for laboratory tests, and dietary pattern form. **Results:** The average age of the sample was 9.5±0.2, with 53.9% of boys and 46.2% of girls. Among the prevalences found, 51.0% of infants had some change in BMI, of which 29.2% were obese and 25.0% were overweight in private schools versus 6.3% were obese and 15.6% were overweight in public schools. It was observed that 60.6% had an alteration in fasting glycemia (113.1±1.4 mg/dl), 51.9% in Cholesterol (196.0±2.9 mg/dl), 43.3% in results with alterations of HDL (40.5±0.4 mg/dl), LDL in 19.2% of infants with increased normal value (143.6±4.0 mg/dl) and TG above recommended value in 20.2% (158.8±10.7 mg/dl). Likewise, a statistically significant increase in food intake was observed, with priority for the sugar group. **Discussion:** The sample studied presents significant alterations for overweight and obesity, as well as values of food portions, glycemia, and dyslipidemias. **Conclusions:** The study in this area is important in order to map and improve the nutritional profile to reduce the risks to which children are exposed.
Key words: Pediatric Obesity; Body Mass Index; Disorders of Infant Nutrition; Child Nutrition; Clinical Enzymatic Assays.

Resumo

Introdução: Hábitos alimentares inadequados na infância predispõem ao surgimento de doenças metabólicas na fase adulta, objetivando a identificar alterações de IMC em escolares no município de Poços de Caldas-MG-BR, com idades entre 6 a 12 anos, avaliar análises bioquímicas, dados antropométricos e padrão alimentar. **Material e Métodos:** Estudo quantitativo de campo, desenvolvido em três escolas, uma de ensino público e duas de ensino privado, no período de 2015 a 2016, com amostragem de 104 crianças. As variáveis de interesse foram dados antropométricos, amostragem sanguínea para exames laboratoriais e formulário de padrão alimentar. **Resultados:** A idade média da amostra foi 9,5±0,2, sendo 53,9% meninos e 46,2% meninas. Entre as prevalências encontradas, 51,0% das crianças tiveram algum tipo de alteração no IMC, sendo 29,2% de obesidade e 25,0% de sobrepeso na escola particular frente a 6,3% obesidade e 15,6% sobrepeso na escola pública. Observou que 60,6% apresentam alteração para glicemia em jejum (113,1±1,4 mg/dl). Colesterol 51,9% de alteração (196,0±2,9 mg/dl), HDL 43,3% mostram alterados (40,5±0,4 mg/dl), LDL percebe 19,2% das crianças apresentam aumento do valor normal (143,6±4,0 mg/dl) e TG 20,2% acima do valor recomendado (158,8±10,7 mg/dl). Foi possível observar ainda uma alta significantemente estatística na ingesta alimentar dando prioridade ao grupo de açúcares. **Discussão:** A amostra estudada apresenta alterações significativas para sobrepeso e obesidade, bem como para valores de porções alimentares, glicemia e dislipidemias. **Conclusões:** Mostra-se importante estudo na área a fim de mapear e melhorar o perfil nutricional para diminuir os riscos aos quais as crianças estão expostas.
Palavras chave: Obesidade Pediátrica; Índice de Massa Corporal; Transtornos da Nutrição Infantil; Nutrição da Criança; Ensaios Enzimáticos Clínicos.

Resumen

Introducción: Los hábitos alimenticios inadecuados en la infancia predisponen al surgimiento de enfermedades metabólicas en la fase adulta, por ello, este estudio tiene por objeto identificar los cambios del IMC en alumnos del municipio de Poços de Caldas-MGBR, con edades de 6 a 12 años, así como evaluar análisis bioquímicos, datos antropométricos y patrones de alimentación. **Materiales y Métodos:** Estudio cuantitativo de campo, desarrollado en tres escuelas, una pública y dos privadas, en el período 2015- 2016, con un muestreo de 104 niños. Las variables de interés correspondieron a datos antropométricos, muestreo sanguíneo para exámenes de laboratorio y formulario de patrones alimenticios. **Resultados:** La edad promedio de la amuestra fue de 9,5±0,2, con 53,9% de niños y 46,2% de niñas. Entre las prevalencias encontradas, 51 ,0% de los infantes tuvieron algún tipo de cambio en el IMC, de los cuales 29,2 correspondía a obesidad y 25,0% a sobrepeso en las escuelas privadas versus 6,3% de obesidad y 15,6% de sobrepeso en la escuela pública. Se observó que 60,6% presentan una alteración de la glicemia en ayunas (113,1±1,4 mg/dl). Colesterol 51,9% de alteración (196,0±2,9 mg/dl), HDL con 43,3% de resultados con alteraciones (40,5±0,4 mg/dl), LDL de 19,2% de los infantes que presentan aumento del valor normal (143,6±4,0 mg/dl) y TG 20,2% por encima del valor recomendado (158,8±10,7 mg/dl). Igualmente, se pudo observar un alza significativamente estadística en la ingesta de alimentos, con prioridad para el grupo de azúcares. **Discusión:** La muestra estudiada presenta alteraciones significativas para sobrepeso y obesidad, así como valores de porciones alimenticias, glicemia y dislipidemias. **Conclusiones:** El estudio en esta área resulta importante con el fin de mapear y mejorar el perfil nutricional para disminuir los riesgos a los que están expuestos los niños y niñas.
Palabras clave: Obesidad Pediátrica; Índice de Masa Corporal; Trastornos de la Nutrición Infantil; Nutrición del Niño; Ensayos Enzimáticos Clínicos.

How to cite this article: *Paiva ACT, Couto CC, Masson APL, Monteiro CAS, Freitas CF. Obesidade Infantil: análises antropométricas, bioquímicas, alimentares e estilo de vida. Rev Cuid. 2018; 9(3): 1-13. http://dx.doi.org/10.15649/cuidarte.v9i3.575*

INTRODUCTION

Obesity is related to an excessive accumulation of the adipose tissue layer in the body, considered a disease of increasing epidemiological character, causing concerns to public health agencies due to predisposition to other pathologies. The eating imbalance in childhood causes health complications such as diabetes, cardiovascular disease, dyslipidemia and they range from physical to psychic status, reducing the quality of life, requiring continuous medical monitoring in adulthood and increasing the risk of mortality[1].

Studies conducted in recent years support the hypothesis that childhood obesity increases the chances of developing obesity in adulthood if left untreated, contributing to the risks of developing cardiovascular disease[2]. Factors such as genetics, increased daily food servings, reduction of nutrients and associated inactivity to new technologies are considered risk factors for the disease. The routine and family structure changed, as well as the growing supply of food products, aiming at practicality in response to the modern lifestyle, are considered aggravating to the disease[3,4].

However, the habit of consuming simple sugars and saturated fats has been increasing in the general population, due to the lack of time and convenience. The current demographic and economic changes associated with scientific development also drive an environment conducive to weight gain and obesity, influencing the sedentary lifestyle of these children, who put aside the games that allowed them to exercise in a pleasant way[4]. According to WHO, approximately 41 million children under the age of 5 are obese or overweight, with prevalence in low- and middle-income countries increasing from 4.8% to 6.1% between 1990 and 2014[5]. Data suggests that childhood eating patterns persist until adolescence due to the genetic component in their taste[6].

The Pan American Health Organization, together with the World Health Organization (PAHO / WHO), states the need to teach children about healthy eating by creating the PAHO Nutrition Profile Model in 2016 to classify beverages. and food, identifying excess of critical components, such as sugars, salt, total fats, saturated and trans[7]. The natural intake of foods has been gradually decreasing by the population, despite the nutritional recommendations to improve the quality of life, among them, the tubers, cereals, fruits, vegetables, and legumes, together with a significant increase in food of unknown origin[8].

The family plays a fundamental role in the lifestyle that will be adopted by the child, especially the parents, who are responsible for providing guidance on healthy eating and the importance of physical activity. In addition to guidance, provide nutritious foods and conditions to practice physical activities, seen as the most important phase for the creation of habits that the child will have throughout life. In general, recent research shows trends where authoritarian parents have children

with a normal weight-related standard and BMI, while permissive parents have children with the greatest changes in normality patterns[9,10].

Nurses are responsible at the Basic Health Unit (BHU), to encourage community participation in actions of promotion and prevention, in performing nursing consultations, measurement of anthropometric measurements and identification of nutritional deviation[11]. Nursing, if active in school care, can reduce the difficulties that arise regarding child health, presenting strategies that minimize problems and contribute to primary health care[12,13].

Prevention covers and includes the action of health professionals in a given population according to their needs. These professionals are responsible for putting into practice technical decisions, direct and educational action, taking into account the epidemiological profile. Prevention means anticipating the occurrence or make sure it does not happen. Therefore, it demonstrates the importance of nurses› articulation with other sectors of society, contributing to their duties in relation to the prevention of childhood obesity. Public Health Care Policies should be emphasized in schools[14].

From this context, this study has as its guiding question: *Do children's nutritional habits interfere with quality of life?* Aiming to identify the eating pattern in private and public school students comparing the results of biochemical analysis and anthropometric data.

MATERIALS AND METHODS

This is a comparative field study with quantitative approach, developed in three schools, one public and two private, in the city of Poços de Caldas - MG. (IBGE, 2015)

Data collection was performed with children from 6 to 12 years of age, at the homes and schools of participants. Taking a sample of 104 children from a population of 350 children. Some bio- socioeconomic variables including age, gender, anthropometric data (weight, height, BMI, blood pressure) and eating habits were assessed through interviews, using a form adapted to frame the sample. In addition, blood samples were collected for triglycerides, blood glucose, total cholesterol (TC) and fractions (HDL and LDL). Private schools the evaluation was on students with ages from 7 to 11 years of age, due to lack of quantitative data for the other samples.

Food intake was classified according to participants' reports, without the influence of parents. The food history of the day prior to collection, breakfast, lunch, dinner and breaks, and the frequency of eating in portions of food for a period of one week, according to the Brazilian Society of Pediatrics (SBP). Using a base of little, medium or much, through a flagged container for the children to locate and so it was possible to calculate the number of portions later on. All children reported in their own way how much they ate using the history of the previous day and the number of portions consumed in a

week, being considered both at home and at school. Two collections of food forms were performed at different times. After that, data were tabulated and analyzed with the values stipulated for children recommended by the SBP[15].

Weight (in kilograms) was verified using a digital scale, using the school uniform without shoes. Height (in centimeters) was measured using a one-meter non-distensible tape measure positioned at an angle of 90 degrees to the floor on a wall without a footer. The participant was asked to remove the shoes, feet joined against the wall to support the heel, calf, buttocks, shoulder blades and head, keeping his body erect looking at the horizon. A 30 cm ruler positioned at the top of the head was used to read the height measurement. These measurements made it possible to calculate BMI (weight / height2), which was evaluated according to the child growth curves of BMI for age separated by male and female recommended by the Brazilian Ministry of Health[16].

Blood pressure was verified using a sphygmomanometer calibrated according to the guidelines by the Brazilian Hypertension Guidelines: prior rest for at least 5 minutes sitting; three consecutive measurements with a 1-minute interval between them; flat back and uncrossed legs; use of child cuff appropriate to arm size[17].

Blood samples were collected by venipuncture, collecting 3 to 4 ml of blood, stored in an EDTA vacutainer tube, which were centrifuged, separated from plasma and frozen in the freezer at a temperature of -5ºC or - 8ºC . Blood glucose was measured at the time of collection, using a drop of venous blood measured in glycosylated tube with tape dosage of the same brand. Total cholesterol and fractions and triglycerides were subsequently dosed in the laboratory of PUC MINAS campus Poços de Caldas and evaluated according to the Dyslipidemia Guidelines[18,19].

Samples were analyzed in the biochemistry laboratory, under the guidance of the Pharmaceutical professional, Biochemist and Prof. Dr. Cristiane Fonseca Freitas, CRF MG10365 -9 . Analyzes were performed using cholesterol, HDL, triglyceride enzymatic kits by visible and digital ultraviolet spectrophotometry.

Inclusion criteria were children from 6 to 12 years of age, intellectually able to answer the questionnaire, regularly enrolled in the school where the instrument was applied. All children had to have a consent form signed by their parents and consent to blood sampling on the day of collection. The project was approved to the ethical procedures established by Resolution 466/12 of the National Health Council by the Research Ethics Committee of the Pontifical Catholic University of Minas Gerais CAAE: 43599315.1.0000.5137 approved on June 16, 2015, following the institution's ethical procedures. As this study was conducted with minors, the parents signed the informed consent form and the child signed a consent form for the research.

This study was limited by parental adherence due to invasive procedure regarding blood collection, and also the refusal of some minors to accept the collection. In addition, some of the selected children were excluded from the study because their responses at the time of the questionnaire were influenced by their parents and guardians.

Statistical analysis was performed using GraphPad InStat version 3.1 software with the help of a statistical advisor. Results are presented in relative frequencies (%) and continuous data are expressed as mean ± SEM. where the value of * p <0.05 and ** p <0.01 are considered statistically significant.

RESULTS

104 children were evaluated, 58 children from public school and 46 from private school. The average age of the sample was 9.5 ± 0, 2 years, and 53, 9 % (56) of the male children and 46 2 % (48) female children. The values were analyzed by dividing the children into two groups, public school and private school, subdivided into male and female and aged from 6 to 12 years. In private school did not obtain quantitative for the ages of 6 and 12 years.

In the analysis of BMI, the private school boys had 29.2 % were obese, 25.0 of overweight, 33.3% in the normal pattern and 12.5% underweight. Girls showed 22.2% obesity, overweight 11.1%, 44.5 % with normal standards and 22.2% low weight. In the public school boys showed a prevalence of 6.3 % were obese, 15.6% were overweight, 71.9 % normal range and 6.3 % underweight. The girls showed 13.3% obesity, 30. 0 % overweight, 40.0 % within normal parameters and 16.7 % low weight. (Figure 1).

Values are expressed as a percentage (%). It is considered: B = Low Weight; N = Normal; S = Overweight; O = Obesity.

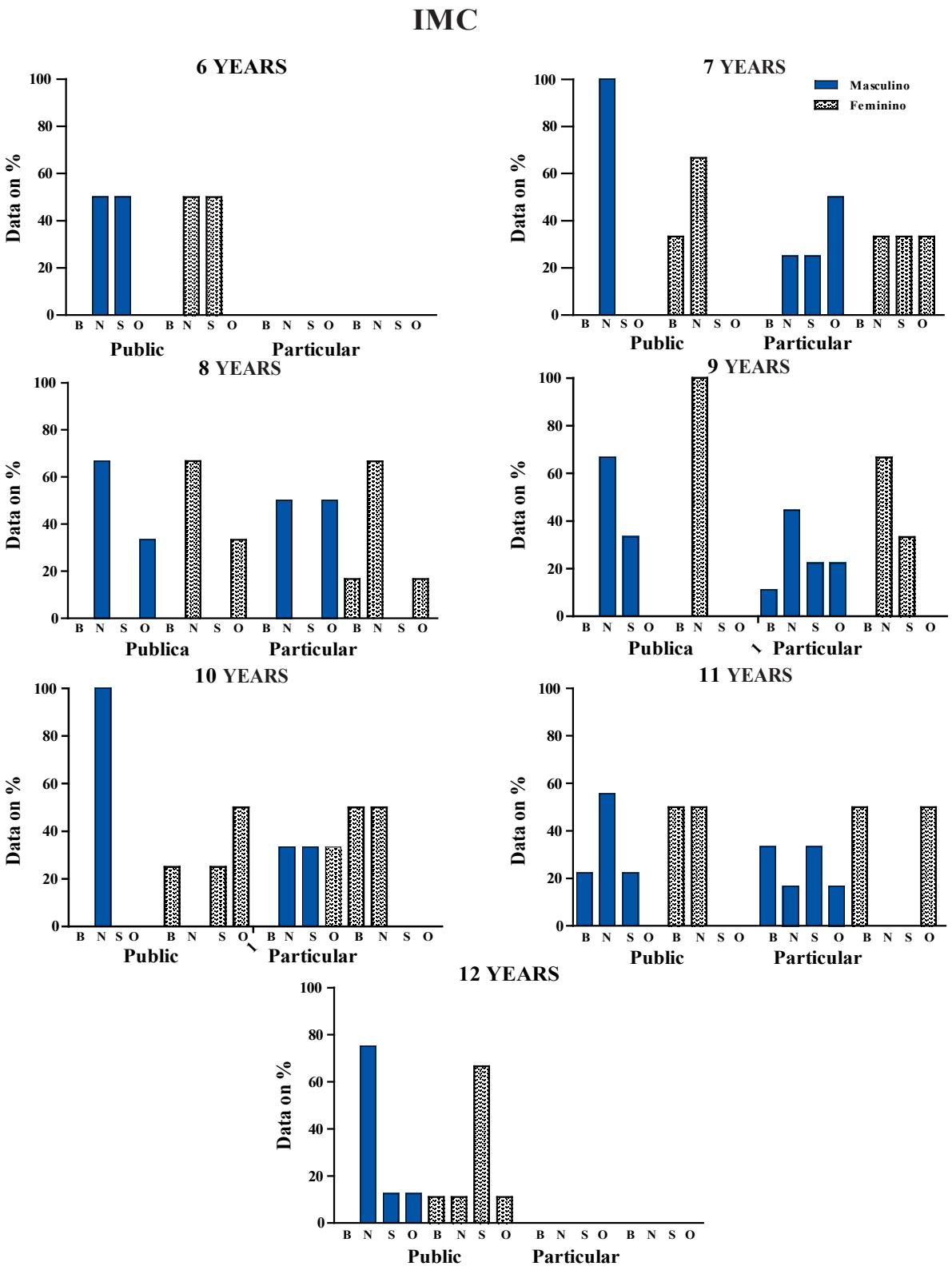

Figure 1. Body Mass Index (BMI) for children, divided by gender and age from 6 to 12 years in public and private schools in the city of Poços de Caldas. Minas Gerais, Brazil, 2016

Source: Authors' collection.

The glucose, in the private school, 66.7 % of boys and 50.0 % of girls showed significant changes (109.9 ± 1, 9 mg / d L and 107.1 ± 1.8 mg / d l , respectively) . In the public school, 56.3 % of boys and 66.7 % of girls showed changes in blood glucose (121 1 ± 2, 8 mg / d l and 111 3 ± 2 5 mg / d l, respectively). Figure 2 shows the mean age-separated glycemic changes (Figure 2).

Values are expressed as means ± SEM, values ** p <0.01 were considered significant.

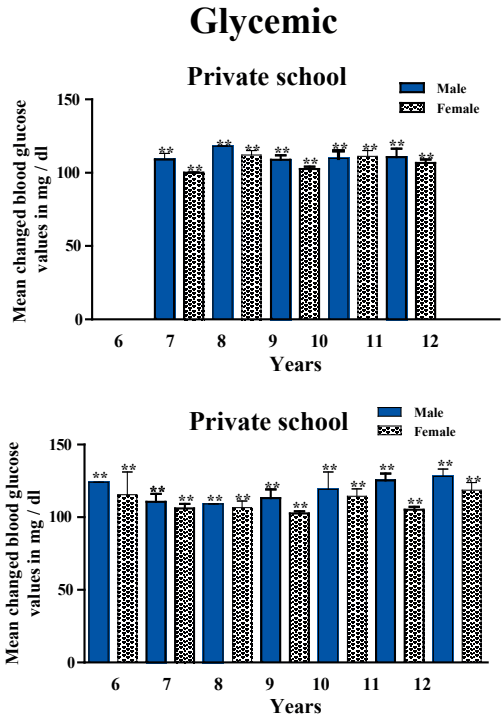

Figure 2. Graphs of glycemic mean alterations of children, divided by gender and age in public and private schools in the city of Poços de Caldas. Minas Gerais, Brazil, 2016

Source: Authors' collection.

Analysis of triglycerides, in priovate school, 25.0 % of boys showed increased values (194.0 ± 25.9 mg / dl) and girls 27.8 % (127.6 ± 23.2 mg / dl). The public school 15.6 % of boys (160.0 ± 12.8 mg/dl) and 16.7 % of girls (146.6 ± 4.5 mg/ dl) (Table 1 and 2).

In relation to cholesterol, in private school, 33.3 % of boys showed a significant change (185.3 ± 3.3 mg/dl) and 33.3 % of girls (194.7 ± 7, 5 mg/dl). In the public school, 62.5 % of children with an average of 196.8 ± 4.7 mg/dl, and 66.7 % of girls with an average of 199,.9 ± 5.6 mg/dl (Table 1 and 2).

In the analysis of HDL, 62.5 % of private school children had values below the recommended averaging 39.9 ± 0.7 mg/dl. In girls, 50.0 % showed one average of 41.3 ± 0.7 mg/dl. In the public school, 34.4 % of boys showed changes with average 40. 1 ± 0.9 mg/dl and girls 33.3 % with a mean of 41.2 ± 0.9 mg/dl (Table 1 and 2).

Regarding LDL, in private school 12.5% of boys showed normal values, with an average of 134.2 ± 1.4 mg/dl, and girls 11.1 % with an average of 152.7 ± 21. .0 mg / dl. In the public school, boys showed 15.6 % of change above recommended values, averaging 148.0 ± 9.6 mg/dl and female 33.3 % with 142.5 ± 5.6 mg/d 1 (Table 1 and 2) .

Table 1. Distribution of blood changes mean in private schools divided by gender and age. Minas Gerais, 2016. (n = 46)

Reference Dosages / Values									
		Triglycerides		Cholesterol		HDL		LDL	
Age	Gender	< 129,00 mg/dl		< 169,00 mg/dl		> 45,00 mg/dl		<129,00 mg/dl	
		Mean SD%		Mean SD%		Mean SD%		Mean SD%	
7	M	211,5±36,5	100,0***	175,2±0,2	25,0*	38,2±0,7	75,0*	---	
	F	---		187,3±9,1	100,0*	42,3±1,4	50,0*	---	
8	M	---		---		43,0±0,2	100,0*	---	
	F	146,9±0,8	16.7*	204,5±12,3	50,0**	39,9±0,8	50,0*	152,7±21,0	33,3*
9	M	---		189,2±5,1	44,4*	39,2±1,1	66,7*	135,3±1,6	22,2*
	F	182,2±0,9	33,3**	---		40,8±1,8	66,7*	---	
10	M	---		181,9±0,5	33,3*	36,3±0,3	33,3**	131,9±1,0	33,3*
	F	---		---		42,4±2,4	50,0*	---	
11	M	158,8±15,7	16,7*	184,4±8,0	33,3*	41,1±1,6	50,0*	---	
	F	157,9±0,1	25,0*	180,7±0,3	25,0*	41,1±0,5	50,0*	---	

Statistically significant values of * p <0.05 ** p <0.01 and *** p <0.001.

Source: Research Data, 2016

Table 2. Distribution of blood changes mean in public schools divided by gender and age. Minas Gerais, 2016. (n = 58)

Reference Dosages / Values											
		Triglycerides			Cholesterol			HDL			LDL		
Age	Gender	< 129,00 mg/dl			< 169,00 mg/dl			> 45,00 mg/dl			<129,00 mg/dl		
		Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
6	M	---			213,1±0,1	50,0**		---			139,4±0,2	50,0*	
	F	130,9±0,5	25,0		214,4±11,6	100,0**		43,2±0,1	25,0		157,8±27,4	50,0*	
7	M	185,3±0,1	33,3**		192,4±4,7	67,7		38,2±0,1	33,3*		---		
	F	152,6±0,3	33,3*		216,5±10,4	100,0**		---			141,2±0,1	33,3*	
9	M	---			179,3±0,1	33,3		37,8±0,4	67,7*		---		
	F	145,4±0,2	33,3		194,9±0,5	33,3		34,3±0,1	33,3**		131,6±0,3	33,3	
10	M	---			213,5±8,8	100,0**		42,0±0,5	25,0		139,5±7,5	50,0**	
	F	---			217,5±13,2	100,0**		41,3±1,9	50,0*		143,8±5,9	100,0*	
11	M	196,1±0,0	11,1		193,3±8,5	100,0**		44,4±0,2	11,1		160,8±24,2	2,2**	
	F	157,8±0,4	25,0*		173,4±9,1	50,0		42,4±1,8	50,0		---		
12	M	139,5±3,0	37,7		194,2±0,1	12,5		39,9±1,6	62,5*		---		
	F	146,1±0,0	11,1		176,0±8,3	33,3		42,5±0,8	33,3		129,6±0,3	11,1	

Statistically significant values of * p <0.05 ** p <0.01 and *** p <0.001.
Source: Research Data, 2016.

Regarding the systolic blood pressure (SBP), 7. 7 % of the children reported changes, averaging 133 8 ± 5 2 mmHg and for diastolic blood pressure (DBP) 8, 7 % of children have alterations with average of 88, 9 ± 3,3mmHg.

Regarding the practice of continuous physical exercises during the week, 100, 0 % of children were in some form of physical activity. Of these latter, 59, 2 % perform activities only within school hours. Of the remaining 40.8% who perform activities outside of school hours 47.5% of children perform only one activity, 22.5% performed two activities, and 30, 0 % of them perform three or more activities. All private school students perform physical activities in and out of school hours.

Regarding food portions, we observed an exacerbated intake of sugars, at all ages, in both public and private schools. Bread, cereals, tubers and roots, and oils and fats are also above the recommended intake. For the recommended intake below the threshold, we highlight water, fruits, vegetables, vegetables, beef, chicken, fish, eggs, and milk, cheese and yogurt. The Table 3 and Table 4 show changes in the number of servings recommended by the SBP separated by private and public schools (Table 3 and Table 4) .

Table 3. Distribution of means of changes in food intake in a private school, according to food groups. Minas Gerais, 2016. (n = 46)

Age			7th		8th		9th		10th		11th	
Food Groups	Portions	Sex	Mean	SD %	Mean	SD %	Mean	SD %	Mean	SD %	Mean	SD %
Bread, cereals, tubers and roots	6	M	7,0±0,0	75,0*	8,0±0,0	50,0**	8,0±0,6	33,3**	8,5±0,5	66,0**	7,5±0,3	66,7*
		F	7,7±0,3	100,0*	7,2±0,4	83,3*	7,7±0,3	100,0*	7,5±1,5	100,0*	8,0±2,0	50,0**
Oil and fat	1	M	2,3±0,3	25,0**	2,5±0,5	50,0**	2,0±0,0	44,4*		---	2,5±0,3	16,7**
		F	2,7±0,3	33,3**	2,0±0,3	16,6*	2,0±0,0	33,3*		---		---
Sugars	2	M	9,5±3,6	100,0***	7,5±2,5	100,0**	8,8±1,1	100,0***	8,0±1,2	100,0***	5,7±0,8	100,0**
		F	8,0±1,2	100,0***	5,7±0,6	100,0**	7,0±0,6	100,0**	5,0±1,0	100,0**	6,8±1,8	100,0**
Fruits	4	M	1,3±0,6	100,0**	1,5±0,5	100,0**	1,3±0,4	100,0**	0,0±0,0	100,0***	0,8±0,5	83,3***
		F	1,0±1,0	66,7**	1,3±0,3	100,0**	0,3±0,3	1000***	1,0±0,0	100,0**	1,3±0,5	100,0**
Vegetables and legumes	4	M	1,8±0,6	100,0**	1,5±0,5	100,0**	1,7±0,4	100,0**	1,3±0,3	100,0**	1,7±0,2	100,0**
		F	1,3±0,3	100,0**	1,2±0,3	100,0**	0,7±0,7	100,0***	0,0±0,0	50,0***	1,0±1,0	50,0**
Legumes	1	M	0,0±0,0	25,0*	1,2±0,3	100,0*	0,0±0,0	33,3*	0,0±0,0	33,3*	0,0±0,0	33,3*
		F	0,0±0,0	33,3*	1,2±0,3	100,0*	0,0±0,0	33,3*		---	0,0±0,0	50,0*
Meat and egg	2	M	1,0±0,0	50,0*	1,2±0,3	100,0*	0,5±0,3	44,4*	1,0±0,0	33,3*	0,7±0,3	50,0*
		F	1,2±0,2	33,3*	1,2±0,3	100,0*	0,5±0,5	66,7*	1,0±0.0	50,0*	1,0±0,0	50,0*
Milk, cheese and yogurt	3	M	1,7±0,3	75,0*	1,2±0,3	100,0*	1,3±0,3	88,9*	1,3±0,3	100,0*	1,0±0,4	100,0*
		F	1,5±0,5	66,7*	1,2±0,3	100,0*	1,0±1,0	66,7*	1,5±0,5	100,0*	1,3±0,3	75,0*
Water	2 L	M	0,9±0,1	100,0**	1,2±0,3	100,0*	0,8±0,1	100,0**	0,7±0,2	100,0**	0,9±0,2	100,0**
		F	1,1±0,2	100,0*	1,2±0,3	100,0*	1,0±0,1	100,0*	1,0±0,0	100,0*	1,0±0,2	100,0*

Statistically significant values of * p <0.05 ** p <0.01 and *** p <0.001.

Source: Research Data, 2016

Table 4. Distribution of means of changes in food intake in public school, according to food groups. Minas Gerais, 2016. (n = 58)

Age			6 th		7th		8th		9th		10th		11th		12th	
Food Groups	Portions	Sex	Mean	SD %	Mean	SD %	Mean	SD %	Mean	SD %	Mean	SD %	Mean	SD %	Mean	SD %
Bread, cereals, tubers and roots	6	M	7,3±0,3	50,0*	---		7,2±0,2	66,7*	7,8±0,3	33,3*	7,5±0,5	50,0*	8,5±0,7	44,5*	7,2±0,6	37,5*
		F	7,7±0,3	75,0**	7,5±0,6	33,0**	8,3±1,2	100,0*	7,0±1,0	66,7*	7,5±0,5	50,0*	7,3±0,3	25,0*	8,2±0,3	66,7*
Oil and fat	1	M	2,5±0,5	100,0**	3,0±1,0	66,0**	2,3±0,3	100,0**	2,7±0,3	100,0**	3,0±1,0	50,0**	2,5±0,5	44,5**	3,2±0,4	75,0**
		F	2,3±0,3	75,0**	---		---		2,0±0,0	33,3*	2,0±0,0	75,0**	4,8±0,3	25,0***	3,0±0,6	33,3**
Sugars	2	M	6,5±1,5	100,0***	5,3±0,9	100,0**	5,3±0,3	100,0**	7,7±1,2	100,0***	5,8±0,5	100,0**	7,0±0,7	100,0***	7,1±0,4	100,0***
		F	4,3±0,3	100,0**	6,7±0,9	100,0***	7,7±1,5	100,0***	7,0±1,5	100,0***	9,0±1,3	100,0***	5,3±0,8	100,0**	8,4±0,6	100,0***
Fruits	4	M	1,5±0,5	100,0**	2,3±0,3	100,0**	1,3±0,3	100,0**	1,7±0,9	100,0**	1,3±0,5	100,0**	1,2±0,4	100,0**	0,7±0,5	87,5***
		F	1,0±0,4	100,0**	2,0±0,6	100,0**	1,7±0,3	100,0**	1,7±0,9	100,0**	1,5±0,3	100,0**	1,8±0,6	100,0**	1,3±0,2	88,9**
Vegetables and legumes	4	M	---		3,0±0,3	33,0*	2,0±1,0	66,7**	1,5±0,5	66,7**	---		2,5±0,5	22,2*	1,9±0,4	100,0**
		F	1,5±0,3	100,0**	1,3±0,9	100,0**	1,0±0,6	100,0**	1,5±0,5	66,7**	1,0±0,4	100,0**	1,0±0,0	75,0**	1,1±0,3	100,0**
Legumes	1	M	0,0±0,0	100,0*	0,0±0,0	33,0*	1,0±0,0	33,3*	0,0±0,0	66,7*	0,0±0,0	50,0*	0,0±0,0	33,3*	0,0±0,0	62,5*
		F	0,0±0,0	75,0*	0,0±0,0	33,0*	---		0,0±0,0	66,7*	---		0,0±0,0	25,0*	0,0±0,0	33,3*
Meat and egg	2	M	0,5±0,5	100,0*	0,7±0,3	100,0*	1,3±0,3	66,7*	0,5±0,5	66,7*	0,7±0,3	75,0*	0,6±0,2	87,5*	0,4±0,2	62,5*
		F	1,0±0,0	75,0*	0,7±0,3	66,0*	0,8±0,2	66,7*	0,5±0,5	66,7*	1,0±0,5	25,0*	0,5±0,5	25,0*	0,7±0,2	66,7*
Milk, cheese and yogurt	3	M	1,5±0,5	50,0*	1,3±0,3	100,0*	1,5±0,5	66,7*	1,7±0,3	100,0*	1,0±0,6	75,0*	1,3±0,2	100,0*	1,2±0,4	62,5*
		F	1,3±0,3	100,0*	1,0±0,0	100,0*	1,5±0,5	66,7*	1,7±0,3	100,0*	1,3±0,3	75,0*	1,3±0,3	100,0*	1,2±0,3	66,7*
Water	2 L	M	0,8±0,1	100,0**	1,3±0,8	100,0*	1,3±0,4	100,0*	0,7±0,2	100,0**	0,7±0,1	100,0**	0,9±0,1	100,0**	0,9±0,1	100,0**
		F	0,9±0,2	100,0**	1,3±0,8	100,0*	0,9±0,1	100,0**	0,7±0,2	100,0**	1,3±0,4	100,0*	1,0±0,1	100,0*	1,1±0,1	100,0**

Statistically significant values of * p <0.05 ** p <0.01 and *** p <0.001.
Source: Research Data, 2016.

DISCUSSION

Data show that overweight is prevalent in the studied sample, both in private and public schools. A study conducted in 2014 in the city of Maringá, with 4609 children aged 6 to 11 years, also showed overweight (22.2%) and obesity (7.5%) in private school compared to 15.4% overweight and 7, 0 % obesity in public school, our values are above the previous study, which confirms the hypothesis of a high overweight in the child population , there is a higher incidence in children from private schools compared to public schools due to eating more caloric and varied foods offered by their parents. This may be linked to f acyl access to fast food with low nutritional content and with increasing intake beyond the recommended daily values are for the age group, still showing a low consumption of fresh food and healthy[20].
Regarding food portions, all ages in both schools show changes in the number of recommended daily intakes, giving special importance to sug-

ars that presented considerable value above the recommended by the SBP. In addition, the ingestion of fruits, vegetables and legumes ("in natura" foods), presented below the recommended, which confirms the data presented by the Ministry of Health, and reinforces the need to improve the dietary pattern of the Brazilian population, trying to reduce demand for high energy processed foods[21,22].

2015 study in the city of San Miguel West, SC, 66 children aged 6 to 13 years were evaluated than 25, 8 % had a bad power supply 36, 4 % of children fed reasonably, with 28.8% good nutrition, which may be linked to the fact that they eat at inappropriate times, not following the recommendation of periods of three hours and division of six daily meals, ingesting less, but in larger quantities[13].

From the total sample, 82, 7 % presented some kind of dyslipidemia. A study conducted in 2013 with 886 overweight children aged 2 to 18 followed by medical consultation, which presented 42.1% diagnoses with dyslipidemia, shows a prevalence of morbidities in a very young population, with a large number of overweight and obesity. , which leads to concern about a poor prognosis in adulthood[23, 24].

In a sample of 95 children and adolescents from 2 to 19 years of age, in the city of Blumenau, the presence of Metabolic Syndrome (MS) was evaluated, with a frequency of 44.2%, with significant changes in HDL and BMI. Our results show that more than half of the children analyzed had altered blood glucose. The fact that increased blood glucose may correlate with sugar intake, leading to great concern regarding the chance of these children becoming possible diabetic patients, but for diagnosis it is necessary to monitor blood glucose[25, 26].

CONCLUSIONS

The children's eating pattern does not comply with the recommended by the responsible bodies. In addition, we evidenced a leap in the number of children with overweight and obesity presenting dyslipidemia and increased blood glucose levels, risk factors for cardiovascular disease, these children, however, showed no oscillating values for systolic and diastolic blood pressure which may be linked to the practice of daily exercises even if only in the school environment. It is of great importance to have an active search for obesity and control of the possible morbidities that these children may develop, as well as amplified work in the face of healthy infant feeding practices, and their importance for child development.

Conflicts of interest: The authors declare that there is no conflict of interest.

REFERENCES

1. **Reis P, Richter D.** A influência da mídia na obesidade infantil brasileira: uma análise sob a ótica da proteção integral. Semin Int Demandas Sociais e Políticas Públicas na Soc Contemp. 2014; 1(11): 20.
2. **Medeiros ER, Pinto ESG, Paiva ACS, Nascimento CPA, Rebouças DGC, Silva SYB.** Facilidades e dificuldades na implantação do Programa Saúde na Escola em um município do nordeste do Brasil. *Rev Cuid*. 2018; 9(2): 2127-34. https://doi.org/10.15649/cuidarte.v9i2.514
3. **Maia CSC, Sette R de S.** Consumo alimentar infantil em uma cidade do sul de Minas: uma proposta de inspiração antropológica. *Organ Rurais Agroindustriais*. 2015; 17(1): 87-100.
4. **Paiva NMN, Costa JS.** A influência da tecnologia na infância: desenvolvimento ou ameaça? *Psicol Pt*. 2015; 1-13.
5. **Organização das Nações Unidas.** Brasil assume compromisso de frear avanço da obesidade até 2019.
6. **Madruga SW, Araújo CLP, Bertoldi AD, Neutzling MB.** Tracking of dietary patterns from childhood to adolescence. *Rev Saúde Pública*. 2012; 46(2): 376-86. https://doi.org/10.1590/S0034-89102012005000016
7. **Organização Pan-Americana da Saúde.** Modelo de Perfil Nutricional da Organização Pan-Americana da Saúde. Washington: *OPAS*; 2016. 38 p.
8. **Organização Pan-Americana da Saúde.** Organização das Nações Unidas para a Alimentação e Agricultura. Panorama de la seguridad alimentaria y nutricional. Santiago: *OPAS*; 2016. 174 p.
9. **Dornelles AD, Anton MC, Pizzinato A.** O papel da sociedade e da família na assistência ao sobrepeso e à obesidade infantil: percepção de trabalhadores da saúde em diferentes níveis de atenção. *Saúde E Soc*. 2014; 23(4): 1275-87. https://doi.org/10.1590/S0104-12902014000400013
10. **Pérez LM, Mattiello R.** Determinantes da composição corporal em crianças e adolescentes. *Rev Cuid.* 2018; 9(2): 2093-104. https://doi.org/10.15649/cuidarte.v9i2.534
11. **Corgozinho JNC, Ribeiro GC.** Registros de Enfermagem e o enfoque na prevenção da obesidade infantil. *Rev Enferm Cent-Oeste Min*. 2013; 3(3): 863-72.
12. **Monteiro FPM, Araujo TL, Ximenes LB, Vieira NFC.** Ações de promoção da saúde realizadas por enfermeiros na avaliação do crescimento e desenvolvimento infantil. *Cienc y Enferm*. 2014; xx (1): 97-110. https://doi.org/10.4067/S0717-95532014000100009
13. **Ribeiro AJP, Ferrasso SM, Ludwig CC, Altenhofen D, Viviani NA, Bencke T.** Padrão alimentar de escolares de uma escola municipal de São Miguel do Oeste, Santa Catarina. Unoesc Ciênc – *ACHS*. 2015; Esp: 73-8.
14. **Victorino SVZ, Soares LG, Marcon SS, Higarashi IH.** Viver com obesidade infantil: a experiência de crianças inscritas em programa de acompanhamento multidisciplinar. *Rev Rede Enferm Nordeste*. 2014; 15(6): 980-9. http://dx.doi.org/10.15253/rev%20rene.v15i6.3295
15. **Sociedade Brasileira de Pediatria.** Manual de orientação departamento de nutrologia. 3ed. Rio de Janeiro: *SBP*; 2012. 152 p.
16. **Ministério da Saúde.** Orientações para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica do Sistema de Vigilância Alimentar e Nutricional - SISVAN. Brasilia: *Editora MS*; 2011. 76 p.
17. **Malachias MVB, Souza W, Plavnik FL, Rodrigues CIS, Brandão AA, Neves MFT, et al.** 7a Diretriz brasileira de hipertensão arterial. *Arq Bras Cardiol*. 2016; 107(3): 83.
18. **Xavier HT, Izar MC, Neto F, R J, Assad MH, Rocha VZ, Sposito AC et al.** V Diretriz Brasileira de Dislipidemias e Prevenção da Aterosclerose. *Arq Bras Cardiol*. 2013; 101(4): 20. https://doi.org/10.5935/abc.2013S010
19. **Universidade Federal de São Paulo.** Manual de coleta de material biológico. São Paulo: *UNIFESP*; 2015. 55 p.
20. **Rosaneli CF, Baena CP, Auler F, Nakashima ATA, Netto-Oliveira ER, Oliveira AB, et al.** Aumento da pressão arterial e obesidade na infância: uma avaliação transversal de 4.609 escolares. *Arq Bras Cardiol*. 2014; 1-7. https://doi.org/10.5935/abc.20140104
21. **Rosaneli CF, Auler F, Manfrinato CB, Rosaneli CF, Sganzerla C, Bonatto MG, et al.** Avaliação da prevalência e de determinantes nutricionais e sociais do excesso de peso em uma população de escolares: análise transversal em 5.037 crianças. *Rev Assoc Médica Bras*. 2012; 58(4): 472-6. https://doi.org/10.1590/S0104-42302012000400019
22. **Ministério da Saúde (BR).** Guia Alimentar da população brasileira [Internet]. 2 ed. Brasília: MS. 2014. 156 p. Disponível em: http://189.28.128.100/dab/docs/portaldab/publicacoes/guia_alimentar_populacao_brasileira.pdf
23. **Marques T, Moniz M, Cabral M, Nizarali Z, Coelho R, Monteiro AC, et al.** Obesidade infantil: caraterização de uma população com seguimento hospitalar. *Acta Pediátrica Port*. 2013; 44(6): 295-300.
24. **Ruiz E, Bañuelos Y, Bañuelos P, Álvarez A, Valles MM, Domínguez CJ.** Porcentaje de grasa corporal en escolares y su asociación con el estilo de vida y macronutrientes. *Rev Cuid.* 2015; 6(2): 1022-8. https://doi.org/10.15649/cuidarte.v6i2.150
25. **Cunha JB, Chiarelli G, Vargas DM.** Síndrome metabólica em crianças e adolescentes com excesso de peso assistidas em policlínica universitária de nível secundário. *Rev AMRIGS.* 2016; 60(3): 206-13.
26. **Geremias LM, Evangelista LF, Silva RC, Furtado DS, Silveira-Monteiro CA, Freitas CF.** Prevalência do diabetes mellitus associado ao estresse ocupacional em trabalhadores bancários, Minas Gerais, Brasil. *Rev Cuid*. 2017; 8(3): 1863-74. https://doi.org/10.15649/cuidarte.v8i3.442