Differences between obese and severely obese adolescents in relation to the effects of a multidisciplinary intervention on hypertriglyceridemic waist phenotype

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Abstract:

This study compared obese and severely obese adolescents in relation to the effects of a multidisciplinary intervention on hypertriglyceridemic waist (HW) phenotype. Subjects consisted of 44 adolescents, aged between 10 and 18 yrs of age. They were divided into two groups: obese group (n=25) and severely obese group (n=19). Both groups underwent a multidisciplinary intervention in which body composition, waist circumference, and triglycerides levels were assessed before and following the intervention. Following the 16-wk intervention, we observed a reduction in the prevalence of HW phenotype in both groups (-24.0% OG; -10.5% in SOB; P=0.901 between the groups). Changes in body composition were similar between the groups. The findings indicate that the multidisciplinary program decreased the prevalence of HW phenotype and improved body composition similarly between obese and severely obese adolescents.

Keywords: Obesity | Adolescent | Exercise and Eating Behavioral Intervention | Hypertriglyceridemic Waist

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Differences between Obese and Severely Obese Adolescents in Relation to the Effects of a Multidisciplinary Intervention on Hypertriglyceridemic Waist Phenotype

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ABSTRACT

Matsuo AR, Da Silva DF, Bianchini JAA, Hintze LJ, Antonini VDS, Lopera CA, Hernandes F, McNeil J, Nardo Junior N. Differences between Obese and Severely Obese Adolescents in Relation to the Effects of a Multidisciplinary Intervention on Hypertriglyceridemic Waist Phenotype. **JEPonline** 2016;19(2):68-75. This study compared obese and severely obese adolescents in relation to the effects of a multidisciplinary intervention on hypertriglyceridemic waist (HW) phenotype. Subjects consisted of 44 adolescents, aged between 10 and 18 yrs of age. They were divided into two groups: obese group (n=25) and severely obese group (n=19). Both groups underwent a multidisciplinary intervention in which body composition, waist circumference, and triglycerides levels were assessed before and following the intervention. Following the 16-wk intervention, we observed a reduction in the prevalence of HW phenotype in both groups (-24.0% OG; -10.5% in SOB; P=0.901 between the groups). Changes in body composition were similar between the groups. The findings indicate that the multidisciplinary program decreased the prevalence of HW phenotype and improved body composition similarly between obese and severely obese adolescents.

Key Words: Obesity, Adolescent, Exercise and Eating Behavioral Intervention, Hypertriglyceridemic Waist

INTRODUCTION

Excess body weight, particularly caused by an accumulation in abdominal body fat, is one of the main risk factors for cardiovascular disease. In particular, it is associated with several metabolic abnormalities such as, dyslipidemia, insulin resistance, type 2 diabetes mellitus, and hypertension (17).

The hypertriglyceridemic waist (HW) phenotype (13) has been proposed to be a tool to diagnose and predict the presence of the atherogenic metabolic triad of nontraditional risk factors (hyperinsulinemia, hyperapobetalipoproteinemia, and increased levels of small, dense LDL particles). It is also an alternative diagnoses for metabolic syndrome, and an indicator of cardiovascular disease risk associated with abdominal obesity.

The prevalence of this phenotype corresponds to 7.2% of the adolescents in Brazil (6). Furthermore, overweight and obese adolescents show an increased risk of presenting the HW phenotype compared to their lean counterparts (6,10). However, the comparison between different degrees of excess body weight is scarcely studied, especially regarding the effects of an exercise and nutritional intervention according to the degree of excess body weight in adolescents to show if it would influence the magnitude of change in each BMI category. Ricco et al. (19) observed similar prevalence of metabolic syndrome risk factors between overweight and obese adolescents. On the other hand, severely obese adolescents presented a higher risk for metabolic syndrome risk factors (18) and a lower VO_2 max before starting an eating and exercise behavioral change intervention (1) compared to their obese counterparts.

It is important to identify if the degree of body weight influences the effects of a multidisciplinary intervention for obesity treatment in adolescents. Thus, the purpose of this study was to compare obese and severely obese adolescents in relation to the effects of a multidisciplinary intervention on the presence of hypertriglyceridemic waist phenotype.

METHODS

Subjects

This study was conducted at a state university in Brazil as part of a public health service offered to the community. It was designed to evaluate the effectiveness of interventions in real-life practice conditions. For the current analysis, there was no randomization of groups since they were divided based on the BMI classification of obese (OG) or severely obese (SOG) in accordance with the cut-offs proposed by Cole and Lobstein (5). The adolescents' age varied from 10 to 18 yrs of age.

We used the following inclusion criteria for this study: (a) agreement of each subject and his or her parents or legal guardian to participate in the multidisciplinary program of obesity treatment (MPOT); and (b) availability of the subjects to fully participate in the intervention. The exclusion criteria were: (a) endocrine diseases previously diagnosed and conveyed to the pediatrician; (b) long-term alcohol consumption; (c) use of glucocorticoids and psychotropics which could influence appetite regulation; and (d) less than 70% compliance in all multidisciplinary interventions.

Although 50 adolescents started the intervention, 6 subjects were excluded because they were unable to complete it due to transportation issues, preference for other activities in the same period, demotivation to continue in the MPOT, and/or they did not attend the last assessment session. Of the 44 who completed the intervention, 25 subjects were classified as obese and 19 subjects were classified as severely obese adolescents. In the OG and SOG, 16 (64.0%) and 11 (57.9%) adolescents were girls with no significant differences between groups (P=0.680), respectively.

The protocol for the MPOT is described in more detail in the work of Bianchini and colleagues (2). Briefly, it is a 16-wk multidisciplinary intervention involving kinesiologists, exercise physiologists, a psychologist, a nutritionist, and a pediatrician. They carried out lectures and practical classes 3 times·wk^{-1} with the adolescents.

This study was approved by the local Ethics Committee (protocol nº 463/2009; Ethics Committee for Human Research), and it is in accordance with the guidelines in the Declaration of Helsinki.

Evaluation

During the week prior to the beginning of the MPOT and the week following the end of the study, the subjects took part in a battery of assessments that included waist circumference (WC) measurements as well as body weight and stature. Each subject's WC was measured with a WISO tape (WISO, Santa Catarina, Brazil) to the nearest 0.1 cm. Triglyceride levels were determined before and after the intervention. Blood draws were conducted by specialists from an outpatient clinic during the morning following a 12-hr overnight fast (Laboclin, Bahia, Brazil). The presence of HW phenotype was assessed according to the criteria established by Esmaillzadeh et al. (10) for adolescents concurrently having serum triglyceride concentrations ≥110 mg·dL^{-1} and a waist circumference equal to or greater than the 90th percentile for their age and gender (11). Additionally, we assessed body composition (relative and absolute fat and lean mass) using bioelectric impedance *InBody 520* (*InBody* Body Composition Analyzers, Korea).

Statistical Analysis

Normality was tested by the Shapiro-Wilk test. The data were presented as descriptive (mean ± SD or median (range) and inferential (Mixed ANOVA for repeated measures to compare moments for each group) statistics. The Chi-Square Test was used to test the differences between sexes in OG and SOB and the differences between OG and SOB regarding the frequency of adolescents who improved their HW phenotype. The significance level was set at $P<0.05$. Effect sizes (ES) were calculated to determine the magnitude of the intervention effect. The magnitude of ES was classified according to Cohen (4) as: ≤0.20 (trivial), between 0.21 and 0.50 (small), between 0.51 and 0.80 (moderate), and >0.80 (large).

RESULTS

The results for the anthropometric variables, body composition, and hypertriglyceridemic waist phenotype (HW) before and after the MPOT in the obese subjects (n=25) and the severely obese subjects (n=19) are presented in Table 1. Following the 16-wk intervention, a decrease was observed in the prevalence of the HW phenotype in both groups (-24.0% OG; -10.5% in SOB). A total of 38.9% (7 from 18) of the subjects from OG had HW phenotype at

baseline and not anymore at post-intervention, while 35.7% (5 from 14) of the subjects from SOG presented the same result (P=0.901).

Table 1. Anthropometric Variables, Body Composition, and Phenotype Waist Hypertriglyceridemic Before and After the MPOT in Obese Subjects (n=25) and Severely Obese Subjects (n=19).

Anthropometric Variables and Body Composition						
	Obese Group (n=25)			**Severely Obese Group** (n=19)		
Variables	**Baseline**	**Post-16 wks**	**ES**	**Baseline**	**Post-16 wks**	**ES**
Body Weight (kg)	76.7 ± 12.5	76.6 ± 12.4	-0.01 (trivial)	91.1 ± 12.1	90.5 ± 11.0	-0.05 (trivial)
BMI ($kg \cdot m^{-2}$)#	29.5 (25.5-33.9)	28.8 (24.1-34.2)*	-0.29 (small)	34.7 (30.3-50.8)	34.3 (28.3-50.3)	-0.16 (trivial)
HC (cm)	106.8 ± 7.7	105.4 ± 7.7	-0.18 (trivial)	118.0 ± 7.9	114.5 ± 8.0*	-0.44 (small)
WHR	0.82 ± 0.05	0.81 ± 0.04	-0.22 (small)	0.82 ± 0.07	0.82 ± 0.06	-0.01 (trivial)
Body Fat (%)#	47.4 (23.5-55.4)	46.0 (16.5-53.8)*	-0.34 (small)	52.5 (43.4-58.4)	51.4 (32.4-56.7)*	-0.44 (small)
Body Fat (kg)	34.5 ± 7.9	32.6 ± 8.3*	-0.23 (small)	45.1 ± 7.4	42.5 ± 7.7*	-0.34 (small)
Lean Mass (kg)	38.7 ± 7.2	40.2 ± 7.6*	0.20 (small)	41.9 ± 7.5	43.5 ± 7.2*	0.21 (small)
Phenotype Waist Hypertriglyceridemic						
	Obese Group (n=25)			**Severely Obese Group** (n=19)		
	Baseline	**Post-16 wks**	**ES**	**Baseline**	**Post-16 wks**	**ES**
TG ($mg \cdot dL^{-1}$)#	117.0 (51.0-119.0)	93.0 (40-383.0)	-0.10 (trivial)	105.0 (57.0-209.0)	93.0 (44.0-234.0)	-0.16 (trivial)
WC (cm)#	88.5 (74.5-99.5)	85.0 (70.8-96.5)*	-0.35 (small)	94.0 (86.5-122.0)	93.0 (83.0-125.0)*	-0.28 (small)

Data presented as mean±SD or median (range)#. *Significant difference from the baseline within group. **ES** = Effect size; **BMI** = Body Mass Index; **HC** = Hip Circumference; **WHR** = Waist-to-hip ratio; **TG** = triglycerides; **WC** = Waist Circumference

DISCUSSION

The present study compared obese and severely obese adolescents in relation to the effects of a multidisciplinary intervention on hypertriglyceridemic waist (HW) phenotype. The findings indicate that the MPOT reduced the prevalence of HW phenotype in both obese and severely obese adolescents with no significant difference between them. Moreover, body composition improvements were also very similar between groups, presenting small effect size for lean mass and fat mass as well as fat percentage.

The HW phenotype has been suggested to be a simple method used to identify the potential risk for the development of cardiovascular disease in adults and adolescents (10,13). Studies show that children and adolescents who present with this condition also had an increased risk of showing negative alterations in low-density lipoprotein cholesterol (LDLc), high-density lipoprotein cholesterol (HDLc), non-high-density lipoprotein cholesterol (non-HDLc), hypercholesterolemia, and the number of risk factors for the metabolic syndrome in comparison to children who did not present the HW phenotype (6,10).

Previous studies have showed that changes in eating behavior and participation in physical exercise led to a reduction in the cardiometabolic risk factors in obese adolescents (2,15). However, to our knowledge, this is the first study to assess the effects of a multidisciplinary intervention program on the changes in the prevalence of the HW phenotype in this population according to the degree of excess body weight (*i.e.,* obese *vs.* severely obese). Differences regarding metabolic syndrome risk factors were not different between overweight and obese adolescents; however, severely obese adolescents presented a higher risk for metabolic syndrome risk factors compared to their obese counterpart (14,18).

Antonini et al. (1) also showed that severely obese adolescents presented lower VO_2 max before starting an eating and exercise behavioral change intervention compared to obese youths. On the other hand, the effects of a multidisciplinary intervention were not influenced by the degree of excess body weight in adolescents according to our results. The magnitude of change for body composition and waist circumference were the same for both groups (small effect size). Moreover, changes in the prevalence of HW phenotype were not different between groups.

The presence of the HW phenotype has been associated with sedentary lifestyles and poor eating habits (12). Thus, this program can be considered as an important intervention tool in implementing important changes in eating habits and physical activity participation, which seem to be an effective treatment for this condition in obese adolescents.

A study by Dâmaso et al. (8) showed that a 1-yr multidisciplinary intervention with exercise, eating, and psychological guidance led to reductions in triglyceride levels in both the hyperleptinemic and non-hyperleptinemic groups. Similar results were found by Szamosi et al. (20) and Carnier et al. (3) following a 4-wk and 1-yr intervention, respectively. This may be explained by important changes in eating and exercise behaviors (especially when aerobic and resistance training are combined), which lead to greater lipid oxidation and reductions in fat mass (9). These results are similar to what was found during the MPOT in the present study.

This study does present certain limitations. It could not be randomized because groups were formed based on the BMI classification. The sample size was small because of groups' separation, which limits the generalizability of the results to other populations (children and adults).

CONCLUSIONS

The present study indicates that the 16-wk multidisciplinary intervention decreased the prevalence of the hypertriglyceridemic waist (HW) phenotype in both obese and severely obese adolescents with additional benefits on body composition for both groups. Future studies evaluate the changes in the prevalence of the HW phenotype in addition to other cardiometabolic and anthropometric variables following a MPOT intervention in other populations.

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