23 - THE ROLE OF MODERATE-INTENSITY EXERCISE AND THE PHYSIOLOGICAL ALTERATIONS OF CHILDREN BEARING PLURIMETABOLIC SYNDROME

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The prevalence of childhood obesity can increase the incidence of early pubarche, which is a common form of sexual precocity occurring between six and seven years old and more commonly in females. Early adrenarche is the commonest etiology of early pubarche. The presence of these factors (obesity, early pubarche and early adrenarche) can increase the incidence of appearance of plurimetabolic syndrome, which can be diagnosed by both clinical and laboratorial criteria. The purpose of this study was to verify the influence of physical activity in children bearing plurimetabolic syndrome attending to a pediatric clinic in Maringá. Methods: This research was experimental, with a sample of 10 children aging from eight to nine years old, all female. The sample was chosen according to the following criteria: early pubarche through clinical diagnosis and bearers of plurimetabolic syndrome. All the patients were assessed at the beginning of the research for body mass index (BMI), blood pressure, laboratory exams of dyslipidemia (LDL, HDL and triglycerides) and blood glucose. The following values were found before the practice of physical activity (mean±standard deviation): BMI= 30±1.4kg/m^2; LDL= 150±9.5mg/dL; HDL= 24.9±3.6mg/dL; Triglycerides= 135.1±10.6mg/dL; Glycemia= 142.3±6.2mg/dL; Systolic Pressure= 160±0.2mmHg; Diastolic Pressure= 109±0.1mmHg. The study lasted for six months with different intensities and amounts of training. Physical practice was carried out three times a week, for one hour each. At the sixth month, another check of the physiological parameters was made. The following results were obtained: BMI=22.2±0.8kg/m^2; LDL= 106.1±3.8mg/dL; HDL= 47.5±3.7mg/dL; Triglycerides= 89.2±3.9mg/dL; Glycemia= 108.5±5.5mg/dL; Systolic Pressure= 111±0.1mmHg; Diastolic Pressure= 77.0±0.67mmHg. Taking into consideration the protocols of the III Brazilian Directives on dyslipidemia and of the Brazilian Society of Cardiology and Hypertension, it is observed that there was a statistically significant improvement on all the parameters evaluated. Key words: children, plurimetabolic syndrome, physical activity.

The concept of Plurimetabolic Syndrome arose in the 20th Century through Maranon in 1922 and Himsworth in 1936, which studied the first symptoms characterizing the syndrome. The investigations continued with Vague and Albrink, who recognized the association of obesity, hyperlipoproteinemia and arteriosclerosis. In 1965, Avogaro and Crepaldi described patients having obesity, diabetes, hyperlipoproteinemia, arterial hypertension and cardiac ischemia and called this collection of chronic-degenerative pathologies Plurimetabolic Syndrome, caused primarily by inadequate nutritional habits and lifestyle. These researchers revealed to the world an ancient problem that, only at this century, is being considered in its totality, the Plurimetabolic Syndrome, an epidemic of today. According to McArdle, Katch & Katch (1990) obesity is related to the appearance of several metabolic and functional dysfunctions, which makes it a current issue of public health.

Obesity has received great attention from health researchers, once it has been pointed as one of the major causes of death due to cardiovascular diseases (GUEDES & GUEDES, 1995). Excess fat is one of the greatest health problems in many countries, specially the industrialized ones. The World Health Organization considers obesity a worldwide problem, because it affects a large number of people, predisposes to morbidity and can lead to death (NAHAS, 2003). Data from IBGE show that, in Brazil, one out of 10 adults is considered obese and the tendency of this proportion is to increase. In the US this proportion is of three obese out of 10 adults. The complications caused by obesity, such as diabetes mellitus, arterial hypertension, dyslipidemia, coronary cardiopathy and cerebral vascular stroke, are serious health problems, which consume increasing amounts of the financial resources to the health services. Manifestations of some kinds of cancer are also described (NIEMAN, 1999). Among the causes of mortality of the obese population, cardiovascular disease is highlighted, particularly coronary artery disease (VIGGIANO, 2001). The increased cardiovascular risk stems from the association between obesity, arterial hypertension and changes on lipid and sugar metabolism. It has been demonstrated that the distribution of fat on the body is more important than the increased weight. The accumulation of fat on the abdominal region, the android type, increases the probability of chronic pathologies and/or mortality, once fat accumulates on the viscera. On the other hand, it is less hazardous when fat accumulates at the periphery, also known as gynecoid type (GUEDES & GUEDES, 1995).

In many countries, specially the developed and developing ones, such as Brazil, there is an increasing concern as for the incidence of childhood obesity, caused by some environmental factors: sedentary lifestyle, inadequate nutrition, abusive consumption of fast foods, as well as by internal factors: genetic, emotional and psychological. Childhood obesity can lead to several negative aspects in the child's life, such as low self-esteem, discrimination by classmates at school during the classes of physical education, problems of relationship and exclusion by the classmates during the plays between classes; normally these are depressed children (VILLARES; RIBEIRO; SILVA, 2006). The obese child can show postural changes such as genus valgus (knees projecting inward), pelvic imbalance and changes of the vertebral column (hyperlordosis, dorsal kyphosis and scoliosis) and of the metabolism: early arterial hypertension, sleep disturbances, high cholesterol, diabetes. When a child reaches 13-14 years old as an obese, he or she has a 40% chance of becoming an obese adult, and if he or she reaches 18 being obese, the probability increases to 80% (HALPERN; GARRIDO, 2006).

The prevalence of childhood obesity can increase the incidence of early pubarche, which is a common form of sexual precocity, occurring between six and seven years old and more commonly in females. Precocious adrenarche is the most common etiology of early pubarche. The presence of these factors (obesity, early pubarche and early adrenarche) can increase the incidence of plurimetabolic syndrome, which can be diagnosed either by clinical or laboratorial criteria. According to the reports of Ford, Giles e Dietz (2002), the presence of three of the following criteria indicate plurimetabolic syndrome: hyperglycemia (=110 mg/dL), hypertriglyceridemia (=150 mg/dL), decreased levels of HDL-cholesterol (< 50 mg/dL for females and < 40 mg/dL for males), high arterial pressure (systolic pressure =130mmHg and diastolic pressure =85mmHg) and abdominal hyperadiposity (> 88 cm for females and > 102 for males). In this context, the purpose of this study was to verify the influence of physical exercise in children bearing the plurimetabolic syndrome attending to a pediatric clinic in Maringá-PR. This experimental research had a sample of 10 female children aging 8-9 years. The sample was chosen according to the following criteria: bearers of early pubarche, diagnosed by pubic hairs before 8 years old, and clinical diagnosis of precocious adrenarche; obesity, arterial hypertension, hyperglycemia, hypertriglyceridemia, high LDL and low HDL levels, thus having the profile of bearers of plurimetabolic syndrome. All the patients were assessed at the beginning of the research for: body mass index (BMI), arterial pressure and laboratorial exams of lipidemia (LDL, HDL and triglycerides) and glycemia. The values found before the beginning of the physical activity are presented in table 1.

The study lasted for six months with different intensities and amounts of training. The physical practice, such as gym,

dancing, walking and biking, was carried out three times a week for one hour each. The experimental protocol was previously subjected to and approved by the Ethics Commission.

From the first to the fourth week aerobic exercises were carried out, such as walking at an intensity of 70% the heart rate of each patient. In the first week six children walked 3 km and four walked 2.8 km. This difference was due to the priority of maintaining the heart rate at 70%. In the last week there was an equalization of the distance walked by all the children, about 3.7 km. Fifty minutes of walking and 10 minutes of active stretching were made.

From the fifth to the eighth week the exercise intensity was increased to 75% of the heart rate. The physical activity was aerobic gym lasting for 50 minutes and 10 final minutes of stretching.

From the ninth to the 12th week recreational activities with circles, sacs, rods, tires and elastic bed were used, at a heart rate of 80%. These activities lasted for 70 minutes, with 10 minutes of stretching at the end.

From the 13th to the 16th week the same activities of the 9th-12th period were made, except that the exercise load was increased (rings of 1 kg, ankle weights of 1 kg, medicine balls of 2 kg). Heart rate was kept at 75%. Duration was of 60 minutes with 10 final minutes of stretching.

From the 17th to the 20th week several kinds of dancing were employed (funk, axé, hip-hop) at a heart rate intensity of 75% and 60-minutes duration, and 10 final minutes of stretching.

From the 21st to the 24th week collective games were played (handball and football) at heart rates of 75% to 80% and 70-minutes duration, with 10 final minutes of stretching.

At the end of the 24th week, that is, six months after the beginning of the physical activities, a new check was made of the physiological parameters. The results obtained are presented in table 1 below.

Table 1: Results of the physiological parameters assessed before and after 6 months of physical exercise in children initially categorized as bearers of plurimetabolic syndrome. The values refer to mean±standard deviation, n=10. * denotes values statistically different (t test, $p<0.01$) relative to the values obtained before physical exercise.

Physiological parameters assessed	Before physical exercise	After six months of physical exercise
BMI (%)	30.0±1,4	22.8±0.8*
LDL (mg/dL)	150.0±9.5	106.1±3.8*
HDL (mg/dL)	24.9±3.6	47.5±3.7*
Triglycerides (mg/dL)	135.1±10.6	89.2±3.9*
Glycemia (mg/dL)	142.3±6.2	108.5±5.5*
Systolic pressure (mmHg)	160±0.2	111±0.1*
Diastolic pressure (mmHg)	109±0.1	7.7 ±0.67*

Following the criteria of the World Health Organization, it is observed that there was a significant improvement of the BMI, withdrawing the individuals from obesity. As for the lipidogram, the values obtained reached levels significantly desirable, according to the American Heart Association; these values put these children away from the risk of chronic-degenerative diseases. As for glycemia and arterial pressure, it was observed a quite significant decrease, the values returning to normality at the end of the follow-up study, reducing the risk of diabetes and hypertension.

Considering the protocols of the III Brazilian Directives on dyslipidemia from the Brazilian Society of Cardiology and Hypertension it is possible to state that there was a statistically significant improvement of all the parameters evaluated. The data further suggest that the physical exercises can improve biochemical (triglyceride, LDL, HDL and glycemia), physiological (percentage of fat), and physiopathological (plurimetabolic syndrome) parameters, being beneficial for the life quality of these children and withdrawing them from non-transmittable infectious diseases, such as plurimetabolic syndrome.

BIBLIOGRAPHY:

AMERICAN HEART ASSOCIATION. Disponível em: <http://www.americanheart.org/presenter.jhtml?identifier=1200000>, Acesso em Ago. 2005.

FORD, E. S.; GILES, W.H.; DIETZ W. H. **Prevalence of the metabolic syndrome among US adults**/findings from the Third National Health and Nutrition Examination Survey. JAMA. N. 3, 2002.

GUEDES, Dartagnan Pinto; GUEDES, Joana Ribeiro Pinto. **Controle do peso corporal.** Londrina, 1995.

HALPERN, Alfredo; GARRIDO, Arthur. Duas Especialidades unidas no combate a obesidade. **Folha da SBEM OnLine.** n.1, dez. 2002. Disponível em: <http://www.endocrino.org.br/folhasbem/materia.php?id=16>, Acesso em: Jul. 2006.

INSTITUTO BRASILEIRA DE GEOGRAFIA E ESTATÍSTICA. http://www.ibge.gov.br/

MCARDLE, W. D; KATCH, F.I.; KATCH, V.L. **Fisiologia do exercício**: energia, nutrição e desempenho humano. 2ª ed. Rio de Janeiro: Ed. Guanabara Koogan, 1990.

NAHAS, M. V. **Atividade física, saúde e qualidade de vida:** conceitos e sugestões para um estilo de vida ativo. 3.ed., Londrina: Mideograf, 2003.

NIEMAN, David. **Exercício e saúde.** Rio de Janeiro: Manole, 1999.

ORGANIZAÇÃO MUNDIAL DA SAÚDE. Disponível em: <http://www.who.int/countries/en/index.html>, Acesso em: Ago. 2005.

SOCIEDADE BRASILEIRA DE CARDIOLOGIA E HIPERTENSÃO. III Diretrizes Brasileiras sobre a dislipidemia e da Sociedade Brasileira de Cardiologia e Hipertensão. Disponível em: <http://scholar.google.com/scholar?q=III%20Diretrizes%20Brasileiras%20sobre%20a%20dislipidemia%20e%20da%20Sociedade%20Brasileira%20de%20Cardiologia%20e%20HipertensÃ£o&hl=pt-BR&lr=&oi=scholart>. Acesso em: Jul. 2005.

VIGGIANO, C.E. **Estudo sobre a prevalência de síndrome plurimetabólica em população da área metropolitana de São Paulo** [Dissertação de mestrado]. São Paulo: Faculdade de Saúde Pública da Universidade de São Paulo. 2001.

VILLARES, Sandra; RIBEIRO, Mauricio; SILVA, Alexandre. Obesidade infantil e exercício. In: **Revista Associação Brasileira para o Estudo da Obesidade e da Síndrome Metabólica/ABESO.** n. 13. Disponível em: <http://www.abeso.org.br>, Acesso em: Jul. 2006.

THE ROLE OF MODERATE-INTENSITY EXERCISE AND THE PHYSIOLOGICAL ALTERATIONS OF CHILDREN BEARING PLURIMETABOLIC SYNDROME

ABSTRACT

The prevalence of childhood obesity can increase the incidence of early pubarche, which is a common form of sexual precocity occurring between six and seven years old and more commonly in females. Early adrenarche is the commonest etiology of early pubarche. The presence of these factors (obesity, early pubarche and early adrenarche) can increase the incidence of appearance of plurimetabolic syndrome, which can be diagnosed by both clinical and laboratorial criteria. The purpose of this study was to verify the influence of physical activity in children bearing plurimetabolic syndrome attending to a pediatric clinic in Maringá. Methods: This research was experimental, with a sample of 10 children aging from eight to nine years old, all female. The sample was chosen according to the following criteria: early pubarche through clinical diagnosis and bearers of plurimetabolic syndrome. All the patients

were assessed at the beginning of the research for body mass index (BMI), blood pressure, laboratory exams of dyslipidemia (LDL, HDL and triglycerides) and blood glucose. The following values were found before the practice of physical activity (mean±standard deviation): BMI= 30±1.4kg/m^2; LDL= 150±9.5mg/dL; HDL= 24.9±3.6mg/dL; Triglycerides= 135.1±10.6mg/dL; Glycemia= 142.3±6.2mg/dL; Systolic Pressure= 160±0.2mmHg; Diastolic Pressure= 109±0.1mmHg. The study lasted for six months with different intensities and amounts of training. Physical practice was carried out three times a week, for one hour each. At the sixth month, another check of the physiological parameters was made. The following results were obtained: BMI=22.2±0.8kg/m^2; LDL= 106.1±3.8mg/dL; HDL= 47.5±3.7mg/dL; Triglycerides= 89.2±3.9mg/dL; Glycemia= 108.5±5.5mg/dL; Systolic Pressure= 111±0.1mmHg; Diastolic Pressure= 77.0±0.67mmHg. Taking into consideration the protocols of the III Brazilian Directives on dyslipidemia and of the Brazilian Society of Cardiology and Hypertension, it is observed that there was a statistically significant improvement on all the parameters evaluated. Key words: children, plurimetabolic syndrome, physical activity.

LE ROLE DE L'EXERCICE PHYSIQUE D'INTENSITé MODéRéE ET LES ALTÉRATIONS PHYSIOLOGIQUES DES ENFANTS TOUCHÉS PAR LE SYNDROME PLURIMÉTABOLIQUE

RÉSUMÈ

La prévalence de l'obésité enfantine peut augmenter l'incidence de l'apparition de la pubarche précoce qui est une forme commune de précocité sexuelle, arrivant entre l'âge de 6 et 7 ans et plus couramment dans le genre féminin. L'adrenarche précoce est l'étiologie plus commune de la pubarche précoce. La présence de ces facteurs (obésité, pubarche et adrenarche précoces) peut augmenter l'incidence de l'avènement du syndrome plurimétabolique pouvant être diagnostiquée par des critères cliniques et de laboratoire. Le but de cette étude a été la vérification de l'influence de l'exercice physique sur les enfants atteints du syndrome plurimétabolique fréquentant une clinique pédiatrique à Maringá. Méthodes : cette recherche est de caractère expérimental avec une population de 10 enfants dans la strate d'âge de 8 à 9 ans, toutes du genre féminin. L'échantillon a été choisi selon les critères suivants, atteintes: pubarche précoce par diagnostique clinique en les classifiant comme souffrant du syndrome plurimétabolique. Toutes les patientes ont été évaluées au début de la recherche quant à l'indice de masse corporelle (IMC), pression artérielle, examens de laboratoire de dyslipidémies (LDL) e HDL) triglycérides et glycémie. Les valeurs suivantes ont été trouvées avant le début de la pratique de l'exercice physique (moyenne $\pm$ déviance standard): IMC = 30 $\pm$ 1,4 Kg/m^2; LDL = 150±9,5mg/dL; HDL = 24,9±3,6mg/dL; Triglycérides = 135,1±10,6mg/dL; Glucose= 142,3±6,2mg/dL; Pression Systolique = 160±0,2mmHg; Pression Diastolique = 109±0,1mmHg. L'étude a durée six mois avec intensités et volumes d'entraînement différents. La pratique d'exercices physiques a été réalisée trois fois par semaine avec une durée d'une heure. Dans le sixième mois une nouvelle vérification des paramètres physiologiques a été réalisée. On a obtenu les résultats suivants: IMC= 22,2±0,8kg/m; LDL= 106,1±3,8mg/dl; HDL= 47,5±3,7mg/dl; Triglycérides = 89,2±3,9mg/dl; Glycémie = 108,5±5,5mg/dl; Pression systolique = 111±0,1mmHg; Pression diastolique= 77,0±0,67mmHg. En considérant les protocoles de la III Directives Brésiliennes sur la dyslipidémie et de la Société Brésilienne de Cardiologie et Hypertension, nous observons qu'il y a eu une amélioration statistique importante de tous les paramètres évalués.

Mots-clés: enfants, syndrome plurimétabolique, activité physique.

EL PAPEL DEL EJERCICIO FÍSICO DE MODERADA INTENSIDAD Y LAS ALTERACIONES FISIOLÓGICAS EN NIÑOS PORTADORES DEL SÍNDROME PLURIMETABÓLICO

RESUMEN

La prevalecencia de obesidad infantil puede aumentar la incidencia de la pubarca precoz, que es una forma común de precocidad sexual, que se presenta entre los 6 y 7 años de edad, siendo más común en el género femenino. La adrenarca precoz es la etiología más común de la pubarca precoz. La presencia de esos factores (obesidad, pubarca precoz y adrenarca precoz) puede aumentar la incidencia en el surgimiento del síndrome plurimetabólico, el cual se puede diagnosticar a través de criterios clínicos y de análisis laboratoriales. El objetivo de este estudio fue verificar la influencia del ejercicio físico en niños que sufren del referido síndrome, los cuales asisten a una clínica pediátrica en la ciudad de Maringa. Métodos: Esta investigación fue de carácter experimental en 10 niños de edad entre los 8 y 9 años, todos del género femenino. Se escogió la muestra de acuerdo a los siguientes criterios: acontecimiento: pubarca precoz a través del diagnóstico clínico clasificadas como portadoras del síndrome plurimetabólico. Se evaluó a todas las pacientes al comenzar la investigación en ralación a: índice de masa corporal (IMC), presión arterial, exámenes laboratoriales de dislipidemia (LDL y HDL, triglicéridos) y glicemia. Los siguientes valores se encontraron antes de que empezara la práctica de ejercicios físicos (media ± desvío patrón): IMC= 30±1,4kg/m^2; LDL= 150±9,5mg/dL; HDL= 24,9±3,6mg/dL; Triglicéridos= 135,1±10,6mg/dL; Glicosis= 142,3±6,2mg/dL; Presión Sistólica= 160±0,2mmHg; Presión Diastólica= 109±0,1mmHg. El estudio tuvo seis meses de duración con diferentes intensidades y volúmenes en el entrenamiento. La práctica de ejercicio físico se realizó tres veces a la semana, con duración de una hora. Al sexto mes, se hizo una nueva verificación de los parámetros fisiológicos. Se obtuvieron los siguientes resultados: IMC= 22,2±0,8kg/m; LDL= 106,1±3,8mg/dl; HDL= 47,5±3,7mg/dl; Triglicéridos= 89,2±3,9mg/dl; Glicemia= 108,5±5,5mg/dl; Presión sístólica= 111±0,1mmHg; Presión diastólica= 77,0±0,67mmHg. Considerándose los protocolos de la III Diretrices Brasileñas sobre la dislipidemia y de la Sociedad Brasileña de Cardiología e Hipertensión, se observa que hubo una mejoría estadísticamente significativa de todos los parámetros evaluados.

Palabras clave: Niños - Síndrome plurimetabólico - Actividad física.

O PAPEL DO EXERCÍCIO DE INTENSIDADE MODERADA E AS ALTERARAÇÕES FISIOLÓGICAS DAS CRIANÇAS PORTADORAS DA SÍNDROME PLURIMETABÓLICA

RESUMO

A prevalência da obesidade infantil pode aumentar a incidência do aparecimento da pubarca precoce, que é uma forma comum de precocidade sexual, ocorrendo entre 6 a 7 anos de idade e mais comumente no gênero feminino. A adrenarca precoce é a etiologia mais comum da pubarca precoce. A presença desses fatores (obesidade, pubarca precoce e adrenarca precoce) pode aumentar a incidência no aparecimento da síndrome plurimetabólica, que pode ser diagnosticada por critérios clínicos e laboratoriais. O objetivo desse estudo foi verificar a influência do exercício físico em crianças portadoras da síndrome plurimetabólica, freqüentadoras de uma clínica pediátrica da cidade de Maringá. Métodos: Esta pesquisa foi de caráter experimental com uma população de 10 crianças na faixa etária de 8 a 9 anos de idade, todas do gênero feminino. A amostragem foi escolhida segundo os seguintes critérios, acometimento: pubarca precoce através do diagnóstico clínico classificando-as como portadores da síndrome plurimetabólica. Todas as pacientes foram avaliadas no início da pesquisa quanto ao: índice de massa corporal (IMC), pressão arterial, exames laboratoriais de dislipidemia (LDL e HDL, triglicérides) e glicemia. Os seguintes valores foram encontrados antes do início da prática do exercício físico (média ± desvio padrão): IMC= 30±1,4kg/m^2; LDL= 150±9,5mg/dL; HDL= 24,9±3,6mg/dL; Triglicérides= 135,1±10,6mg/dL; Glicose= 142,3±6,2mg/dL; Pressão Sistólica= 160±0,2mmHg; Pressão Diastólica= 109±0,1mmHg. O estudo teve seis meses de duração com diferentes intensidades e volumes no treinamento. Foram realizadas três vezes semanais, a prática de exercício físico, com duração de uma hora. No sexto mês, foi feita uma nova verificação dos parâmetros fisiológicos. Obteve-se os seguintes resultados: IMC= 22,2±0,8kg/m; LDL= 106,1±3,8mg/dl; HDL= 47,5±3,7mg/dl; Triglicérides= 89,2±3,9mg/dl; Glicemia= 108,5±5,5mg/dl; Pressão sístólica= 111±0,1mmHg; Pressão diastólica= 77,0±0,67mmHg. Levando em consideração os protocolos da III Diretrizes Brasileiras sobre a dislipidemia e da Sociedade Brasileira de Cardiologia e Hipertensão, observa-se que houve uma melhora estatisticamente significativa de todos os parâmetros avaliados.

Palavras-chaves: crianças, síndrome plurimetabólica, atividade física.