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ORIGINAL ARTICLE

Insulin resistance in obese children and adolescents☆,☆☆

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KEYWORDS
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Obesity;
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Risk factors;
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Abstract
Objective: To evaluate the presence of insulin resistance and its association with other metabolic abnormalities in obese children and adolescents.
Methods: Retrospective study of 220 children and adolescents aged 5-14 years. Anthropometric measurements were performed (weight, height, and waist circumference) and clinical (gender, age, pubertal stage, and degree of obesity) and biochemical (glucose, insulin, total cholesterol, and fractions, triglycerides) data were analyzed. Insulin resistance was identified by the homeostasis model assessment for insulin resistance (HOMA-IR) index. The analysis of the differences between the variables of interest and the HOMA-IR quartiles was performed by ANOVA or Kruskal-Wallis tests.
Results: Insulin resistance was diagnosed in 33.20% of the sample. It was associated with low levels of high-density lipoprotein cholesterol (HDL-C; $p = 0.044$), waist circumference measurement ($p = 0.030$), and the set of clinical and metabolic ($p = 0.000$) alterations. Insulin-resistant individuals had higher mean age ($p = 0.000$), body mass index (BMI; $p = 0.000$), abdominal circumference ($p = 0.000$), median triglycerides ($p = 0.001$), total cholesterol ($p \leq 0.042$), and low-density lipoprotein cholesterol (LDL–C; $p \leq 0.027$); and lower HDL-C levels ($p = 0.005$). There was an increase in mean BMI ($p = 0.000$), abdominal circumference ($p = 0.000$), and median triglycerides ($p = 0.002$) as the values of HOMA -IR increased, with the exception of HDL-C, which decreased ($p = 0.001$). Those with the highest number of simultaneous alterations were between the second and third quartiles of the HOMA–IR index ($p = 0.000$).

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Conclusion: The results confirmed that insulin resistance is present in many obese children and adolescents, and that this condition is associated with alterations that represent an increased risk for developing metabolic disorders in adulthood.

PALAVRAS-CHAVE
Criança;
Adolescente;
Obesidade;
Resistência à insulina;
Fatores de risco;
Síndrome metabólica

Resistência à insulina em crianças e adolescentes obesos

Resumo

Objetivo: Avaliar a presença de resistência à insulina e sua relação com outras alterações metabólicas, em crianças e adolescentes obesos.

Métodos: Estudo retrospectivo de 220 crianças e adolescentes de 5 a 14 anos. Foram realizadas avaliações antropométricas (peso, estatura e circunferência abdominal), clínicas (sexo, idade, estágio puberal e grau de obesidade) e bioquímicas (glicemia, insulina, colesterol total e frações, triglicerídeos). A resistência à insulina foi identificada pelo índice HOMA-IR. A análise das diferenças entre as variáveis de interesse e os quartis do HOMA-IR foi realizada pelos testes ANOVA ou Kruskal-Wallis.

Resultados: A resistência à insulina foi diagnosticada em 33,20% da amostra. Associou-se a níveis baixos de HDL-C ($p = 0,044$), medida da circunferência abdominal aumentada ($p = 0,030$) e ao conjunto de alterações clínicas e metabólicas ($p = 0,000$). Os indivíduos resistentes apresentaram maiores médias de idade ($p = 0,000$), IMC ($p = 0,000$), medida da circunferência abdominal ($p = 0,000$) e maiores medianas de triglicerídeos ($p = 0,001$), colesterol total ($p \leq 0,042$), LDL-C ($p \leq 0,027$) e menores de HDL-C ($p = 0,005$). Houve aumento das médias de IMC ($p = 0,000$), medida da circunferência abdominal ($p = 0,000$) e mediana de triglicerídeos ($p = 0,002$) à medida que os valores do HOMA-IR se elevavam, com exceção dos níveis de HDL-C que diminuíram ($p = 0,001$). Aqueles que apresentaram o maior conjunto de alterações simultâneas estavam entre o segundo e terceiro quartis do HOMA-IR ($p = 0,000$).

Conclusão: Os resultados confirmaram que a resistência à insulina está presente em muitas crianças e em muitos adolescentes obesos, e que esta condição está associada a alterações que representam aumento do risco para o desenvolvimento de distúrbios metabólicos na maturidade.

Introduction

Obesity is a chronic disease with multifactorial etiology. Its occurrence is associated with increased morbidity and mortality and reduced life expectancy. In childhood and adolescence, it often leads to important metabolic alterations, which, depending on the duration and severity, may determine the development of chronic diseases in adulthood.[1,2] In this context, insulin resistance (IR) is emerging as an important disorder among young individuals. Studies have emphasized that patients with IR have a higher predisposition to the future development of metabolic syndrome (MS), type II diabetes mellitus (DM2), and cardiovascular disease. Correlations were identified between IR and clinical and metabolic alterations, especially among obese children and adolescents, indicating that obesity is a major trigger for their development.[3–7]

The mechanisms by which IR occurs are not entirely clear. It is essentially characterized by the decrease in the capacity of attaining normal plasma insulin concentrations, promoting adequate peripheral glucose uptake, maintaining liver glycogenesis in balance, and inhibiting the production of very-low-density lipoprotein.[8] The diagnosis of IR is not easy, due to the lack of a single method capable of estimating the degree of individual sensitivity to insulin.

Among the different methods are the direct tests, which seek to analyze the effects of a predetermined amount of administered insulin (insulin tolerance test, insulin suppression test, and clamping), and the indirect tests, which evaluate the effect of endogenous insulin (fasting insulin, homeostasis model assessment [HOMA], and the oral glucose tolerance test [OGTT]). The gold standard is the hyperinsulinemic euglycemic clamp method, but the complexity and high cost of the method prevent its use in daily clinical practice and in epidemiological studies.[9] The HOMA for insulin resistance (HOMA-IR) index is a widely used method in adults and has been validated in children and adolescents, by comparing with rates based on the OGTT and the hyperinsulinemic euglycemic clamp.

Some authors recommend that cutoff values of approximately 3 are able to identify IR in this population.[10–15] IR is one of the most important effects found in obese patients and it appears to be the factor that triggers other metabolic alterations. Thus, the present study aimed to evaluate the presence of IR and its associations with other metabolic abnormalities in obese children and adolescents.