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REVIEW ARTICLE

Identification of cutoff points for Homeostatic Model Assessment for Insulin Resistance index in adolescents: systematic review

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Abstract

Objective: To identify cutoff points of the Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) index established for adolescents and discuss their applicability for the diagnosis of insulin resistance in Brazilian adolescents.

Data source: A systematic review was performed in the PubMed, Lilacs and SciELO databases, using the following descriptors: ''adolescents'', ''insulin resistance'' and ''Receiver Operating Characteristics Curve''. Original articles carried out with adolescents published between 2005 and 2015 in Portuguese, English or Spanish languages, which included the statistical analysis using Receiver Operating Characteristics Curve to determine the index cutoff (HOMA-IR) were included.

Data synthesis: A total of 184 articles were identified and after the study phases were applied, seven articles were selected for the review. All selected studies established their cutoffs using a Receiver Operating Characteristics Curve, with the lowest observed cutoff of 1.65 for girls and 1.95 for boys and the highest of 3.82 for girls and 5.22 for boys. Of the studies analyzed, one proposed external validity, recommending the use of the HOMA-IR cutoff>2.5 for both genders.

Conclusions: The HOMA-IR index constitutes a reliable method for the detection of insulin resistance in adolescents, as long as it uses cutoffs that are more adequate for the reality of the study population, allowing early diagnosis of insulin resistance and enabling multidisciplinary interventions aiming at health promotion of this population.

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PALAVRAS-CHAVE
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Curva ROC;
Revisão

Identificação dos pontos de corte do índice Homeostatic Model Assessment for Insulin Resistance em adolescentes: revisão sistemática

Resumo

Objetivo: Identificar os pontos de corte do índice Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) estabelecidos para adolescentes e discutir a sua aplicabilidade para o diagnóstico da resistência à insulina em adolescentes brasileiros.

Fontes de dados: Revisão sistemática feita nas bases de dados PubMed, Lilacs e SciELO com os descritores ''Adolescentes'', ''Resistência à insulina'' e ''Curva ROC''. Foram incluídos artigos originais, publicados entre 2005 e 2015, conduzidos com adolescentes, no idioma português, inglês ou espanhol e incluindo análise estatística com uso da curva ROC para determinação dos pontos de corte do índice (HOMA-IR).

Síntese dos dados: Foram identificados 184 artigos e, após a aplicação das etapas do procedimento, foram selecionados sete para compor a revisão. Todos os estudos selecionados estabeleceram seus pontos de corte com a curva ROC. O menor ponto de corte observado foi de 1,65 para meninas e 1,95 para meninos e o maior de 3,82 para meninas e 5,22 para meninos. Dos estudos analisados, um propôs validade externa, recomendando o uso do ponto de corte do HOMA-IR>2,5 para ambos os sexos.

Conclusões: O índice HOMA-IR constitui-se em método confiável para detecção da resistência insulínica em adolescentes, desde que usados os pontos de corte que mais se adequem à realidade da população em estudo, o que permite um diagnóstico precoce da resistência à insulina e possibilita intervenções multiprofissionais para a promoção da saúde dessa população.

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Introduction

Adolescence is a critical period for the onset of obesity and other metabolic disorders associated with body fat accumulation. Adolescents with excess weight have a high risk of becoming obese adults and are prone to developing cardiovascular diseases.[1,2]

Excessive accumulation of body fat, particularly fat located in the central or visceral region, favors the increase in free fatty acids in the bloodstream, which may impair insulin signaling, decreasing the sensitivity of receptors on cell membranes and resulting in insulin resistance (IR).[3]

Brazilian studies have detected the prevalence of IR in the age range of adolescence and have reported prevalence rates ranging from 6.5% to 90.8% in adolescents with and without excess weight.[3-5] The most commonly used methods for determining IR in epidemiological studies are obtained from practical formulas that use fasting glucose and insulin levels, as the Fasting Glucose/Insulin Ratio (FGIR), the Quantitative insulin sensitivity check index (QUICKI) and the Homeostatic Model Assessment for Insulin Resistance (HOMA-IR), which has been frequently validated in children and adolescents and is recommended as the most sensitive and specific method for assessing insulin sensitivity in this population.[6-8] It is noteworthy that one of the important aspects to be observed in the successful application of HOMA-IR index in a given population is the use of specific cutoffs for gender, ethnicity, age and/or sexual maturation level (if used in adolescents). For this reason, several cutoff points have been recommended for the diagnosis of IR based on the index.[9-12] The objective of this study was to identify HOMA-IR index cutoffs established for adolescents and discuss their applicability for the diagnosis of IR in Brazilian adolescents.

Method

Literature search strategy

A systematic literature review of scientific articles on the topic ''Insulin resistance in adolescents'' was carried out, taking into account the following guiding question: ''what are the cutoffs for HOMA-IR index established for IR determination in adolescents with and without metabolic syndrome in observational studies?''.

The definition of the research question was structured according to the acronym PECO, recommended by the Methodological Guidelines for the preparation of systematic review and meta-analysis of comparative observational studies on risk factors and prognosis, in which each letter corresponds to a component of the guiding question: P – population, E – exposure, C – Control, O – Outcome.[13] After determining the question, a search was carried out in the PubMed, Lilacs and SciELO databases.

To search used the following descriptors: ''adolescent'', ''Insulin resistance'' and ''ROC (Receiver Operating Characteristic) curve''. The terms present in the model were found in the list of Medical Subject Headings (Mesh), available from the US National Library of Medicine, and the list of Health Sciences Descriptors, available on the BVS portal.

The search in PubMed used the following strategy: (''adolescent'' [Mesh Terms] OR ''adolescent'' [All Fields] OR ''adolescents'' [All Fields]) AND (''insulin resistance''