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Metabolic syndrome in Mexican children: Low effectiveness of diagnostic definitions☆

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KEYWORDS
Metabolic syndrome;
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Abstract
Background: Early identification of children with metabolic syndrome (MS) is essential to decrease the risk of developing diabetes and cardiovascular disease in adulthood. Detection of MS is however challenging because of the different definitions for diagnosis; as a result, preventive actions are not taken in some children at risk. The study objective was therefore to compare prevalence of MS in children according to the IDF, NCEP-ATP-III, Cook, de Ferranti and Weiss definitions, considering insulin resistance (IR) markers such as HOMA-IR and/or metabolic index (MI).
Methods: A total of 508 Mexican children (aged 9–13 years) from seven schools were enrolled in a cross-sectional study. Somatometric, biochemical, and hormonal measurements were evaluated.
Results: Frequency of MS was 2.4–45.9% depending on the definition used. Frequency of IR in children not diagnosed with MS was 12.4–25.2% using HOMA-IR and 4.0–16.3% using MI. When HOMA-IR or MI was included in each of the definitions, frequency of MS was 8.5–50.2% and 7.7–46.9% respectively. The kappa value including HOMA-IR and/or MI was greater than 0.8.
Conclusions: This study demonstrated the poor effectiveness of the current criteria used to diagnose MS in Mexican children, as shown by the variability in the definitions and by the presence of IR in children who not diagnosed with MS. Inclusion of HOMA-IR and/or MI in definitions of MS (thus increasing agreement between them) decreases the chance of excluding children at risk and allows for MS prevalence between populations.

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PALABRAS CLAVE
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Síndrome metabólico en niños mexicanos: poca efectividad de las definiciones diagnósticas

Resumen
Antecedentes: La identificación oportuna de niños con síndrome metabólico (SM) es la clave para disminuir el riesgo de desarrollar diabetes y enfermedad cardiovascular en la vida adulta, sin embargo, su detección representa un gran reto debido a las diversas definiciones para su diagnóstico dejando excluidos niños con factores de riesgo a los cuales no se les brindarán medidas preventivas. El objetivo es comparar la prevalencia de SM según las definiciones de la IDF, NCEP-ATP-III, Cook, de Ferranti y Weiss e incluir marcadores de resistencia a la insulina (RI) como el HOMA-IR y/o índice metabólico (IM).
Metodología: Estudio transversal en 508 niños mexicanos de 9 a 13 años. Se registraron medidas somatométricas y evaluaron parámetros bioquímicos y hormonales.
Resultados: La frecuencia de SM fue de 2,4-45,9% dependiendo de la definición utilizada. La RI en los niños sin diagnóstico de SM fue del 12,4-25,2% con HOMA-IR y 4,0-16,3% con IM. Al incluir el HOMA-IR o IM en cada una de las definiciones la frecuencia de SM fue 8,5-50,2% y 7,7-46,9% respectivamente. El valor de Kappa incluyendo HOMA-IR e IM fue mayor a 0,8.
Conclusiones: Este trabajo revela la poca efectividad de las definiciones diagnósticas de SM empleadas actualmente, evidenciada por la variabilidad entre ellas y por la presencia de RI en niños que escapan al diagnóstico de SM. Incluir al HOMA-IR y/o IM en las definiciones, disminuye la probabilidad de excluir niños con SM y aumenta la concordancia entre ellas haciendo posible la comparación de la prevalencia de SM entre las poblaciones.

Introduction

Metabolic syndrome (MS) is a public health problem giving rise to two main complications, type 2 diabetes mellitus (DM2) and cardiovascular disease (CVD), which have been the most frequent causes of death since the year 2000.[1] Metabolic syndrome is associated with a two-fold increase in the risk of CVD and a 5-fold increase in the risk of DM2. It is defined by the presence of at least three of the following 5 risk factors: arterial hypertension, increased triglyceride levels, low HDL-cholesterol concentrations (i.e., atherogenic dyslipidemia), altered fasting glucose and abdominal obesity.[2]

In the case of the pediatric population, it is very important to identify those children at risk of developing MS, as these patients are more likely to develop DM2 and CVD over time. Relatively few studies have investigated the prevalence of MS in children and adolescents, though it is evident that MS is very common in the obese pediatric population.[3,4]

In Mexico and in certain Latin American countries such as Chile and Brazil, populations of obese children and adolescents have been studied to determine the prevalence of MS and of insulin resistance (IR).[5–7] It has been postulated that IR and abdominal obesity are the main factors contributing to the manifestations of MS. In this regard, although abdominal obesity has shown a comparatively stronger correlation, many of the metabolic changes appear to be triggered by IR, since the latter exerts effects upon lipid metabolism, which manifest themselves as increased LDL-cholesterol, lowered HDL-cholesterol, and increased triglyceride and fatty acid levels.[8,9]

The diagnosis of MS in children and adolescents poses serious difficulties, bearing in mind that the cut-off points of the different components of the syndrome have not been precisely established in Mexico. As a result, diagnosis and prevalence vary according to the definition used.[10] In this sense, discrepancies in prevalence can be found within the same population sample.[3,4] The present study compares 5 definitions: those of the International Diabetes Federation (IDF), the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP-III), and those of Cook, Ferranti and Weiss, with a view to characterizing the diagnosis of MS in the Mexican pediatric population.[4,10–12] In addition, in evaluating the role of IR in the development of DM2, the study proposes the inclusion of an independent criterion such as the homeostatic model assessment of insulin resistance (HOMA-IR) and/or the metabolic index (MI).[13,14]

Methods

The present cross-sectional study consisted of 508 Mexican children between 9 and 13 years of age from 7 primary schools. The inclusion criteria were: children in the fourth, fifth and sixth year of primary school, the obtaining of written informed consent signed by either a parent or tutor, and the verbal consent of the children, themselves. The study was approved by the Ethics Committee of Hospital Juárez de México, and was carried out in accordance with the recommendations of the Declaration of Helsinki. The exclusion criteria were: the use of antihypertensive drugs, blood glucose-lowering medication or lipid-lowering drugs. The clinical evaluation consisted of the measurement of anthropometric parameters: height, weight and waist circumference according to standardized methods.[15] The body mass index (BMI)