



ORIGINAL ARTICLE

Performance of different diagnostic criteria of overweight and obesity as predictors of metabolic syndrome in adolescents[☆]

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KEYWORDSBody mass index;
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Youth**Abstract**

Objective: To analyze the performance of three different diagnostic criteria of overweight and obesity (WHO, IOTF and Conde and Monteiro) using body mass index (BMI) as predictors of metabolic syndrome (MetS) in a representative sample of adolescents.

Methods: A sample of 1035 adolescents aged 12–20 years (565 girls and 470 boys) was used in the study. BMI was calculated through the quotient of weight (kg)/height squared (m)², and MetS was defined according to the criteria of the International Diabetes Federation. Sensitivity, specificity, and overall accuracy (area under the curve) were estimated using the receiver operating characteristic (ROC) curves method and used to describe the predictive performance.

Results: The three diagnostic criteria showed higher absolute values of sensitivity and specificity for predicting MetS in boys and older adolescents. The highest sensitivity to identify MetS was found using the IOTF criterion (60–85%), while specificity values $\geq 90\%$ were found for the three criteria. The Conde and Monteiro diagnostic criterion pointed to a significantly lower overall accuracy (0.52–0.64) than that of the WHO (0.70–0.84) and IOTF (0.75–0.89) diagnostic criterion.

Conclusions: Overweight and obesity using BMI showed a moderate association with MetS, regardless of the diagnostic criteria used. However, the IOTF criterion showed better predictive capacity for the presence of MetS than the WHO and the Conde and Monteiro criteria.

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PALAVRAS-CHAVE

Índice de massa corporal;
Diagnóstico;
Acurácia;
Risco cardiovascular;
Jovens

Desempenho de diferentes critérios diagnósticos de sobrepeso e obesidade como preditores de síndrome metabólica em adolescentes

Resumo

Objetivo: Analisar o desempenho de três diferentes critérios diagnósticos de sobrepeso e obesidade (WHO, IOTF e Conde & Monteiro) a partir do índice de massa corporal (IMC) como preditores da síndrome metabólica (SMet) em amostra representativa de adolescentes.

Métodos: A amostra foi constituída por 1035 adolescentes (565 moças e 470 rapazes) com idades entre 12 e 20 anos. O IMC foi calculado mediante quociente entre peso (kg)/altura (m)² e SMet foi definida através dos critérios da *International Diabetes Federation*. Desempenho preditivo foi descrito a partir das estimativas de sensibilidade, especificidade e acurácia global (área sob a curva) utilizando-se do método de curvas *Receiver Operating Characteristic*.

Resultados: Os três critérios diagnóstico apresentaram maiores valores absolutos de sensibilidade e especificidade para predição da SMet nos rapazes e nos adolescentes com mais idade. Maior sensibilidade para identificar SMet foi observada utilizando o critério IOTF (60% a 85%), enquanto especificidade $\geq 90\%$ foi observada mediante o uso dos três critérios diagnósticos. O critério diagnóstico Conde & Monteiro apontou acurácia global (0,52 a 0,64) significativamente menor que os critérios diagnósticos WHO (0,70 a 0,84) e IOTF (0,75 a 0,89).

Conclusões: Sobrepeso e obesidade a partir do IMC mostrou uma moderada associação com SMet, independentemente do critério diagnóstico empregado. Contudo, o critério IOTF demonstrou melhor capacidade preditiva para presença de SMet que os critérios WHO e Conde & Monteiro.

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Introduction

Currently, regardless of gender, age, socioeconomic stratum, and geographical region, overweight and obesity have become a global epidemic,¹ which definitively contributes to the onset of cardiovascular risk biomarkers.² In recent years, there have been significant changes in the understanding of biomarkers implicated in the pathogenesis of cardiovascular diseases, including the identification of proinflammatory and anti-inflammatory cytokines, adipokines, chemokines, inflammatory indicators derived from hepatocytes, and some specific enzymes.³ However, at young ages, the use of the so-called traditional risk biomarkers still prevails, with emphasis on metabolic syndrome (MetS).⁴⁻⁶

Nonetheless, the complexity of the procedures necessary to identify MetS makes it difficult to include them in routines for health status monitoring in young individuals, which require alternatives that are more practical and of immediate use. In this sense, previous studies presented evidence that overweight and obesity, identified through the body mass index (BMI), are defined as possible predictors of MetS.⁷⁻⁹ Therefore, adequate classification of overweight and obesity may constitute an important complementary screening tool for the presence of MetS in children and adolescents.

The use of a diagnostic criterion of overweight and obesity based on BMI to screen MetS in adolescents is justified, as it is an accessible and easy-to-use alternative, which has immediate interpretation and good cost-effectiveness. However, it does not seek to replace medical intervention at any time, since it does not exclude the need to monitor

the individual components to confirm the MetS diagnosis. A screening process, when performed in environments with high concentrations of young individuals, such as schools, reaches a high number of adolescents, especially those who have difficulty access to or do not seek the health system. Therefore, once the adolescents most likely to have MetS have been identified, they can be referred for specialized medical follow-up.

There is a consensus regarding the diagnostic criteria to classify overweight and obesity in adults based on BMI; however, this is not the case for children and adolescents. Considering the implications related to the processes of physical growth and biological maturation that start at this stage of development, the significance of BMI for the health of young individuals calls for more complex differentiations than those attributed to adults. In this case, different diagnostic criteria based on BMI have been proposed and have been used to identify excess body weight in young individuals. In the international context, the criteria set forth by the World Health Organization (WHO)^{10,11} and the International Obesity Task Force (IOTF)^{12,13} stand out, whereas the proposal of Conde and Monteiro¹⁴ has received special attention for the specific use in the young Brazilian population. However, there is no consensus on the proposal to be used and, therefore, there are discussions about the validity of each diagnostic criterion when used in specific populations.

Therefore, the aim of the present study was to analyze the performance of the three different diagnostic criteria for overweight and obesity based on BMI (WHO, IOTF, Conde and Monteiro) as predictors of MetS in a representative sample of adolescents.

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