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ORIGINAL ARTICLE

Anthropometric indices to identify metabolic syndrome and hypertriglyceridemic waist phenotype: a comparison between the three stages of adolescence

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Abstract
Objective: To determine the prevalence of metabolic syndrome (MS) and the hypertriglyceridemic waist phenotype (HW) in a representative adolescent sample; as well as to establish which anthropometric indicator better identifies MS and HW, according to gender and adolescent age.
Methods: This cross sectional study had the participation of 800 adolescents (414 girls) from 10-19 years old. Anthropometric indicators (body mass index, waist perimeter, waist/stature ratio, waist/hip ratio, and central/peripheral skinfolds) were determined by standard protocols. For diagnosis of MS, the criteria proposed by de Ferranti et al. (2004) were used. HW was defined by the simultaneous presence of increased waist perimeter (>75th percentile for age and sex) and high triglycerides (>100 mg/dL). The ability of anthropometric indicators was evaluated by Receiver Operating Characteristic curve.
Results: The prevalence of MS was identical to HW (6.4%), without differences between genders and the adolescence phases. The waist perimeter showed higher area under the curve for the diagnosis of MS, except for boys with 17-19 years old, for whom the waist/stature ratio exhibited better performance. For diagnosing HW, waist perimeter also showed higher area under the curve, except for boys in initial and final phases, in which the waist/stature ratio obtained larger area under the curve. The central/peripheral skinfolds had the lowest area under the curve for the presence of both MS and HW phenotype.
Conclusions: The waist perimeter and the waist/stature showed a better performance to identify MS and HW in both genders and in all three phases of adolescence.

PALAVRAS-CHAVE
Antropometria;
Adolescente;
Obesidade abdominal;
Síndrome X metabólica;
Cintura
hipertrigliceridêmica

Indicadores antropométricos para identificar síndrome metabólica e fenótipo cintura hipertrigliceridêmica: uma comparação entre as três fases da adolescência

Resumo

Objetivo: Determinar a ocorrência de síndrome metabólica (SM) e do fenótipo cintura hipertrigliceridêmica (CH) em amostra de adolescentes e estabelecer qual indicador antropométrico melhor identifica SM e CH, de acordo com gênero e fase da adolescência.

Métodos: Estudo transversal com 800 adolescentes (414 meninas) de 10-19 anos. Indicadores antropométricos (índice de massa corporal, perímetro da cintura, relação cintura/estatura, relação cintura/quadril e relação pregas cutâneas centrais/periféricas) foram determinados por protocolos padronizados. Para diagnóstico da SM, foi usada a proposta de Ferranti et al. (2004). A CH foi definida pela presença simultânea de perímetro da cintura aumentado (>75 percentil por idade e sexo) e triglicerídeos elevados (>100 mg/dL). O desempenho dos indicadores antropométricos foi avaliado por meio da curva Receiver Operating Characteristic.

Resultados: A prevalência de SM foi idêntica à de CH (6,4%), sem diferenças entre os gêneros e entre as fases da adolescência. O perímetro da cintura apresentou maior área abaixo da curva no diagnóstico da SM, exceto para meninos entre 17-19 anos, para os quais a relação cintura/estatura exibiu melhor desempenho. No diagnóstico da CH, a cintura isolada apresentou maior área abaixo da curva, exceto para os meninos nas fases inicial e final da adolescência, nos quais a relação cintura/estatura obteve maior área. A relação entre as pregas cutâneas apresentou pior desempenho para identificar SM e CH.

Conclusões: O perímetro da cintura e a relação cintura/estatura mostraram o melhor desempenho para identificar SM e CH em ambos os sexos e nas três fases da adolescência.
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Introduction

Chronic, noncommunicable diseases are considered the leading cause of mortality in developed and developing countries,[1] and their incidence rates are rapidly increasing, especially in developing countries.[2] In Brazil, those diseases account for approximately 70% of mortality.[3]

Metabolic syndrome (MS) is defined as a group of alterations that includes central obesity, dyslipidemia, hyperglycemia, insulin resistance, and systemic arterial hypertension.[4] The hypertriglyceridemic waist (HW) phenotype, one of the components of MS, is identified by the simultaneous presence of high waist circumference and high concentrations of triglycerides.[5] Both phenotypes are important predictors of cardiovascular diseases,[2] but the HW is considered a simpler method for screening individuals at increased cardiometabolic risk.[6]

The prevalence of MS and HW has been widely investigated in adults,[4,5,7-10] but studies in children and adolescents are scarce.[6,11,12] Studies carried out in Iran with children and adolescents aged 6-18 years reported a prevalence of 14.0% and 8.52% of MS and HW, respectively.[6,13] Esmaillzadeh et al.[11] observed MS prevalence of 10.1% in adolescents aged 10-19 years (10.3% in boys and 9.9% for girls) and 6.5% of HW (7.3% in boys and 5.6% in girls). Recently, a study observed HW prevalence of 7.2% in adolescents aged 11-17 years in Salvador city, state of Bahia, Brazil.[12]

Given the paucity of data on the HW phenotype in adolescents and the evidence that the prevalence of MS in children has been increasing,[2] with a tendency to persist into adulthood,[14] it becomes necessary to establish what is the best body fat distribution indicator for early identification of at-risk adolescents, aiming to establish interventions and improve future cardiovascular health.[15] Therefore, the objective of this study was to determine the prevalence of MS and HW phenotype in a representative sample of adolescents and to establish which is the best anthropometric indicator to identify MS and the HW phenotype, according to gender and stage of adolescence.

Method

This is a cross-sectional study, which is part of a broader investigation carried out with adolescents aged 10-19 years, of both genders, from the rural and urban population of public and private schools (from the 5th year of Elementary School to the last year of High School) from the municipality of Viçosa, state of Minas Gerais, Brazil. Sample size was calculated using the Epi Info software, release 6.04. Considering the population aged 10-19 years and 11 months living in the city according to the last census, in a total of 11,898 individuals,[16] the expected prevalence is 50%, as the study considers as outcome multiple cardiovascular risk factors, 5% of acceptable variability, 99% confidence level and 20% increase to control for potential confounding factors; the sample calculation was estimated at 796 in adolescents. The value of 50% of prevalence was chosen because, when the information is not known, the most conservative method, which also maximizes sample size, is to adopt an estimate of 50%.

Inclusion criteria were: no regular use of drugs that altered blood glucose, insulinemia, lipid metabolism and/or blood pressure levels; no participation in weight reduction and control programs; no regular use of diuretics/lax-