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ORIGINAL ARTICLE

Association between fat mass index and fat-free mass index values and cardiovascular risk in adolescents



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KEYWORDS

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Body composition;
Body fat

Abstract

Objective: To describe the association between fat mass index and fat-free mass index values and factors associated with cardiovascular risk in adolescents in the city of Juiz de Fora, Minas Gerais.

Methods: Cross-sectional study was with 403 adolescents aged 10–14 years, from public and private schools. Anthropometric, clinical, and biochemical measurements were obtained, as well as self-reported time spent performing physical exercises, sedentary activities and sexual maturation stage.

Results: Regarding the nutritional status, 66.5% of the adolescents had normal weight, 19.9% were overweight and 10.2% were obese. For both genders, the fat mass index was higher in adolescents who had high serum triglycerides, body mass index and waist circumference.

Conclusions: Adolescents who had anthropometric, clinical and biochemical characteristics considered to be at risk for the development of cardiovascular disease had higher values of fat mass index. Different methodologies for the assessment of body composition make health promotion and disease prevention more effective.

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PALAVRAS-CHAVE

Doenças cardiovasculares/ fatores de risco; Adolescente/ crescimento e desenvolvimento; Composição corporal; Gordura corporal

Associação entre índice de massa de gordura e índice de massa livre de gordura e risco cardiovascular em adolescentes

Resumo

Objetivo: Descrever a relação entre valores de índice de massa de gordura e índice de massa livre de gordura e fatores associados a risco cardiovascular em adolescentes de Juiz de Fora (MG).

Métodos: Estudo transversal feito com 403 adolescentes de 10-14 anos, de escolas públicas e privadas. Avaliaram-se medidas antropométricas, clínicas, bioquímicas, autorrelato do tempo dedicado ao exercício físico, atividades sedentárias e estágio de maturação sexual.

Resultados: Quanto ao estado nutricional, 66,5% dos adolescentes estavam eutróficos, 19,9% com sobrepeso e 10,2% obesos. Para ambos os sexos, o índice de massa de gordura foi maior nos adolescentes que estavam com triglicerídeos séricos, índice de massa corporal e circunferência da cintura elevados.

Conclusões: Os adolescentes que tinham características antropométricas, clínicas e bioquímicas consideradas de risco para o desenvolvimento de doenças cardiovasculares apresentaram maiores valores do índice de massa de gordura. Metodologias diferenciadas para avaliação da composição corporal tornam a promoção da saúde e a prevenção de agravos futuros mais eficazes.

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Introduction

The increased prevalence of overweight in adolescents¹ is associated with risk factors for cardiovascular disease in adulthood and results in high costs for public health.¹ Currently, it is shown that body fat distribution has more influence than total body mass in the presence of cardiovascular risk factors.²⁻⁴ The ability to measure or quantify body fat stores is central for preventing and treating obesity-related diseases.² Therefore, more accurate methods are needed to assess adiposity and do proper screening for early intervention.³⁻⁶

Body mass index (BMI) has been the most widely used anthropometric method for diagnosing overweight, but its predictive ability to identify young people with high body fat is open for discussion in scientific circles.^{5,6} It cannot discriminate between fat mass and lean mass, does not reflect the great changes in body composition that occur in this age group and are different between the sexes.⁵ So it would be more feasible to distinguish the body components through more precise measurements that consider the body fat percentage.²

VanItallie et al.⁷ proposed the use of fat mass index (FMI) and fat-free mass index (FFMI) for a more detailed anthropometric measurement, according to body compartments, by calculation that considers the amount of fat mass and fat-free mass in kg obtained by bioelectrical impedance, with the advantage of relating only one body weight component to the height squared and of being expressed in units that are common to BMI.⁸ With the use of these two indices, it becomes possible to judge whether a deficit or excess of body weight is selectively due to a change in fat-free mass, in fat mass, or both.⁸ Four typical situations can be identified: low FFMI and high FMI, corresponding to

obesity; low FFMI and low FMI, corresponding to leanness; high FFMI and low FMI, corresponding to muscle hypertrophy; and high FFMI and high FMI, corresponding to combined excess of FFMI and FMI. The reference values of these two indices are not yet a consensus in the scientific literature, particularly for adolescents. In the study by Nakao and Komiya,⁹ the reference values of FFMI were 12.7–13.4kg/m² for boys and 12–13kg/m² for girls. As for FMI, the adopted reference values adopted were 2.8–3.6kg/m² for boys and 3.2–3.8kg/m² for girls.

Considering the need for a more detailed anthropometric assessment for adolescents, the aim of this study was to describe the relationship between the values of fat mass index and fat-free mass index and factors associated with cardiovascular risk in adolescents in the Juiz de Fora city, MG.

Method

Cross-sectional study was performed with adolescents, aged 10–14 years, attending public and private schools in Juiz de Fora, MG. The number of schools and students per institution, belonging to that age group, was obtained through the School Census provided by INEP 2009.¹⁰ Thirty-five schools were selected, based on the proportion by city regions. Total sample was based on three parameters: proportion of obesity in the age group studied (8%)¹¹; a desired precision of 2% was accepted, with a significance level of 5%; and 20% losses were considered due to the absence of adolescents in days of data collection or refusal to participate (no consent of teen, or parent/guardian). Students were randomly selected through the table of random numbers and stratified according to sex, age, and proportion in each school.

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