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ORIGINAL ARTICLE

Nutritional status, metabolic changes and white blood cells in adolescents☆

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Abstract

Objective: To analyze the relationship between the peripheral blood white cells, metabolic changes, and nutritional status of adolescents with and without excess weight and body fat.

Methods: This cross-sectional study evaluated the body mass index (BMI) and percentage body fat (%BF) in 362 adolescents from 15 to 19 years of age, of both sexes. White blood cell count, platelet count, uric acid, fasting glucose, insulin, and lipid profile were measured. The inclusion criteria were agreement to participate in the study and signature of the informed consent. Exclusion criteria were: presence of chronic or infectious disease; use of medications that could cause changes in biochemical tests; pregnancy; participation in weight reduction and weight control programs; use of diuretics and laxatives; or the presence of a pacemaker. The following statistical tests were applied: Kolmogorov-Smirnov test, Student's t or Mann-Whitney test, Pearson or Spearman correlation tests, and chi-squared test, considering p<0.05.

Results: Overweight was observed in 20.7% of adolescents. The total cholesterol (TC) had a higher percentage of inadequacy (52.2%), followed by high-density lipoprotein (HDL) (38.4%). There was a positive correlation between white cells and serum lipids, insulin, body fat, and BMI. Monocytes were negatively correlated with BMI, and rods with BMI, body fat, and insulin.

Conclusions: Nutritional status is related to an inflammatory process, and adolescents with excess weight or body fat presented higher amounts of white blood cells.

Estado nutricional, alterações metabólicas e células brancas na adolescência

Resumo

Objetivo: Analisar a relação entre as células brancas do sangue periférico e as alterações metabólicas e estado nutricional de adolescentes com e sem excesso de peso e gordura corporal.

Métodos: Avaliou-se, em estudo transversal, o Índice de Massa Corporal (IMC) e o percentual de gordura corporal (%GC) em 362 adolescentes de 15 a 19 anos de idade, de ambos os sexos. Os critérios gerais de inclusão foram: ter aceitado participar da pesquisa e assinado o termo de consentimento livre e esclarecido. Os critérios de exclusão foram: relatar a presença de doenças crônicas ou infecciosas; usar medicamentos que pudessem causar alteração nos exames bioquímicos; ter engravidado; ter participado de programas de redução e controle de peso; usar diuréticos/laxantes ou usar marcapasso. Realizou-se leucograma, contagem de plaquetas, ácido úrico, glicemia de jejum, insulina e perfil lipídico. Utilizaram-se os testes Kolmogorov-Smirnov, t de Student ou Mann Whitney, correlação de Pearson ou de Spearman e qui-quadrado, considerando significante p<0,05.

Resultados: Excesso de peso foi verificado em 20,7% dos adolescentes. O colesterol total (CT) apresentou maior porcentagem de inadequação (52,2%), seguido da lipoproteína de alta densidade (HDL) (38,4%). Encontraram-se correlações positivas entre células brancas e lipídeos séricos, insulina, gordura corporal e IMC. Os monócitos apresentaram correlação negativa com IMC e os bastonetes com IMC, gordura corporal e insulina.

Conclusões: O estado nutricional está relacionado com um quadro inflamatório, sendo que adolescentes com excesso de peso e/ou de gordura corporal apresentaram maiores quantidades de células brancas.

Introduction

Adolescence corresponds to the stage of life between childhood and adulthood, from 10 to 19 years of age, during which physical, psychological, and social changes occur, with focus on growth, with an increase in weight and height and sexual maturation.[1,2]

This is one of the critical periods for the onset of obesity. Approximately 70% of obese adults started to gain weight during adolescence.[4] Although obesity is associated with several medical complications in adults, the implications of obesity in children and adolescents are yet to be clearly defined.[3,4]

The prevalence of obesity shows increasingly high numbers. It is estimated that in 2030, there will be a worldwide increase of 25% and 32% in cases of overweight and obesity, respectively.[5] According to the Pan American Health Organization (PAHO), obesity affects all age ranges.[5] However, in recent decades, the number of overweight adolescents has increased by approximately 70% in the U.S. and by 240% in Brazil.[5,6]

Obesity, which should be considered a low-level inflammatory condition, is a pro-inflammatory state with hypertrophy and hyperplasia of adipocytes related to metabolic and cardiovascular disorders, such as type 2 diabetes, hypertension, atherosclerosis, dyslipidemia, and acute and chronic inflammatory processes. This is due to the fact that the white adipose tissue produces cytokines or adipocytokines involved in this process.[7-10]

White blood cells or leukocytes are immune defense system cells and are closely linked to the thrombogenic and inflammatory profile, and their levels are associated with metabolic and cardiovascular disorders caused by obesity.[11,12] The change in concentrations of serum lipids can lead to thrombus formation inside arteries and veins, leading to the aggregation of inflammatory markers such as platelets and leukocytes.[7,13] The levels of neutrophils and eosinophils, as well as monocytes and lymphocytes in obese children, may be important in understanding the evolution of inflammation and disease.[3]

Therefore, this study aimed to correlate white blood cells to metabolic and nutritional alterations in adolescents with and without excess weight and body fat.

Method

This was a cross-sectional study conducted in the city of Viçosa, state of MG, between 2011 and 2012, in adolescents aged 15 to 19 years, of both genders, enrolled in public and private schools in the urban area of the municipality.

The sample of 362 adolescents was calculated using Epi Info software, release 6.04 (Centers for Disease Control and Prevention Georgia, United States), based on a specific formula for cross-sectional studies. This study considered a population of 3,608 adolescents in the study age range, a prevalence of 50%, as the study considered as outcome