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ORIGINAL ARTICLE

Association between overweight and obesity in schoolchildren with rs9939609 polymorphism (FTO) and family history for obesity☆,☆☆

Cézane Priscila Reuter[a,b,*], Miria Suzana Burgos[b], Joana Carolina Bernhard[b], Debora Tornquist[b], Elisa Inês Klinger[b], Tássia Silvana Borges[c], Jane Dagmar Pollo Renner[b], Andréia Rosane de Moura Valim[b], Elza Daniel de Mello[a]

[a] *Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil*
[b] *Universidade de Santa Cruz do Sul, Santa Cruz do Sul, RS, Brazil*
[c] *Universidade Luterana do Brasil, Canoas, RS, Brazil*

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Abstract
Objective: To determine the association between overweight/obesity in schoolchildren with FTO rs9939609 polymorphism (fatmass and obesity associated) and family history of obesity.
Methods: Cross-sectional study comprising a sample of 406 children aged 7–17 years in a city in southern Brazil. Overweight/obesity in schoolchildren was assessed by body mass index (BMI), and family history of obesity was self-reported by parents. Polymorphism genotyping was performed by real time PCR (polymerase chain reaction). The association between the nutritional status of schoolchildren with the presence of family obesity, stratified by polymorphism genotypes (AA [at-risk for obesity], AT, and TT), was assessed by prevalence ratio values (PR) through Poisson regression.
Results: Among schoolchildren with the AA genotype, 57.4% had overweight/obesity; the percentage was lower for the AT and TT genotypes (33.1% and 28.9%, respectively). Overweight/obesity in schoolchildren was associated with a family history of obesity, especially among children with the AA genotype. The prevalence was higher among those with an obese mother (PR: 1.28; $p < 0.001$), obese maternal or paternal grandmother (PR: 1.22; $p = 0.047$), and obese paternal grandfather (PR: 1.32; $p < 0.001$).

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☆☆ Study conducted at the Postgraduate Program in Health Promotion, Universidade de Santa Cruz do Sul (UNISC), Santa Cruz do Sul, RS, Brazil; and Postgraduate Program in Child and Adolescent Health, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil.

* Corresponding author.
E-mail: cezanereuter@unisc.br (C.P. Reuter).

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Conclusions: There is an association between the AA genotype of rs9939609 polymorphism and BMI among schoolchildren. The association between overweight/obesity in schoolchildren with a family history of obesity was found mainly among students with the AA genotype.

PALAVRAS-CHAVE
Obesidade;
Genética;
Criança;
Adolescente

Associação entre sobrepeso e obesidade em escolares com o polimorfismo rs9939609 (FTO) e histórico familiar de obesidade

Resumo
Objetivo: Verificar se existe relação entre o sobrepeso/obesidade de escolares com o polimorfismo rs9939609, do gene FTO (*fatmass and obesity associated*) e com o histórico familiar de obesidade.
Métodos: Estudo transversal composto por uma amostra de 406 escolares, de sete a 17 anos, de um município do sul do Brasil. O sobrepeso/obesidade dos escolares foi avaliado por meio do índice de massa corporal (IMC) e o histórico familiar de obesidade por questões autorreferidas pelos pais. Agenotipagem do polimorfismo foi feita por PCR (*polymerase chain reaction*) em tempo real. A associação entre o estado nutricional dos escolares com a presença de obesidade familiar, estratificada pelos genótipos do polimorfismo (AA – risco para obesidade, AT e TT), foi avaliada pelos valores de razão de prevalência (RP), por meio da regressão de Poisson.
Resultados: Entre os escolares com o genótipo AA, 57,4% apresentaram sobrepeso/obesidade; para os genótipos TT e AT, o percentual é inferior (33,1% e 28,9%, respectivamente). O sobrepeso/obesidade do escolar associou-se com o histórico familiar de obesidade, principalmente entre os escolares portadores do genótipo AA, foi superior entre os que apresentam mãe obesa (RP: 1,28; $p < 0,001$), avó materna e paterna obesas (RP: 1,22; $p = 0,047$) e avô paterno obeso (RP: 1,32; $p < 0,001$).
Conclusões: Há relação entre o genótipo AA, do polimorfismo rs9939609, com o IMC dos escolares avaliados. A relação entre sobrepeso/obesidade do escolar com o histórico familiar de obesidade foi encontrada, principalmente, entre os escolares com o genótipo AA.

Introduction

Obesity is a multifactorial condition, determined by environmental and genetic factors, and is a facilitator of several other diseases.[1,2] Associated with cardiovascular diseases and metabolic disorders, conditions previously observed mostly in adults, childhood obesity has currently become a major public health issue.[3] Some fat mass and obesity-associated (FTO) polymorphisms have been associated with fat mass and obesity, especially the rs9939609 polymorphism, with increased risk for obesity in carriers of allele A.[1] Each copy of allele A with the rs9939609 polymorphism is associated with an increase of 0.4 kg/m^2 in BMI and higher chance (1.31-fold increase) of developing obesity.[4] Berentzen et al.[5] and Cecil et al.[3] found an association between a higher percentage of fat and the presence of AA genotype in Danish adults and Scottish children, respectively. Berentzen et al.[5] observed that individuals from Denmark homozygous for allele A are more likely to experience an increase of 10 kg of fat mass (1.3-fold higher chance) when compared to carriers of the TT genotype.

The FTO gene is expressed in the arcuate nucleus of the hypothalamus, a relevant region for appetite behavior, having an effect on homeostasis. Although the FTO gene functions and pathways are unknown, analysis of its structure has shown it is involved in post-translational modification, repair of deoxyribonucleic acid (DNA, which protects the genome from damage that leads to mutations), and fatty acid metabolism.[2,6] The FTO was identified for the first time as a susceptible gene to obesity in two genome studies.[7] Since then, studies have focused on the association of the FTO gene with excessive fat accumulation and its interaction with behavioral factors.[2]

Conversely, it is known that obesity is a multifactorial condition with a strong lifestyle influence and that physical activity acts as a protective factor, regardless of rs9939609 polymorphism genotype.[2] In addition to physical activity, inadequate eating habits are associated with the development of obesity, and parents' behavior has great influence on the consumption of high-calorie foods. Therefore, parents are role models for their children's behavior, influencing their food preferences since early childhood.[8]

Thus, this study aimed to verify whether there is an association between overweight/obesity of children with rs9939609 polymorphism of the FTO gene and their family history of obesity.

Methods

This cross-sectional study included 406 children and adolescents (203 males), aged 7–17, from six schools in the city