J Pediatr (Rio J). 2016;92(5):512–520

Jornal de Pediatria
www.jped.com.br

ORIGINAL ARTICLE

Association of hypertriglyceridemic-waist phenotype with liver enzymes and cardiometabolic risk factors in adolescents: the CASPIAN-III study☆

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Received 28 June 2015; accepted 15 December 2015
Available online 22 June 2016

KEYWORDS
Hypertriglyceridemic waist;
Metabolic syndrome;
Children and adolescent;
Lipid profile;
Liver function test

Abstract
Objective: This study aims to investigate the role of metabolic syndrome (MetS) and the hypertriglyceridemic-waist (HW) phenotype in determining cardiometabolic risk factors and elevated liver enzymes in a national sample of Iranian pediatric population.
Method: This nationwide study was conducted in the framework of the third survey of a surveillance program. Students, aged 10–18 years, were recruited from 27 provinces in Iran. The prevalence of cardiometabolic risk factors was compared in students with and without HW and MetS. The association of HW with different cardiometabolic risk factors was determined.
Results: The mean age of studied population was 14.73 ± 2.41 years. Prevalence of HW and MetS was 3.3% and 4%, respectively. Sixty-nine (71.1%) participants with HW had MetS. The prevalence of obesity, elevated systolic blood pressure, hypercholesterolemia, and elevated alanine aminotransaminase (ALT) was significantly higher in subjects with HW phenotype and MetS than in their peers ($p < 0.05$). A significant association was observed between HW and elevated levels of cholesterol and ALT, as well as between obesity and low HDL-C ($p < 0.05$).
Conclusions: The current findings serve as complementary evidence to previous studies, which have been mainly conducted among adults, suggesting that the HW phenotype is associated with cardiometabolic risk factors, especially with elevated cholesterol and ALT. The authors propose that, in primary care settings and in large epidemiological studies, the measurement of all MetS

☆ Please cite this article as: Kelishadi R, Jamshidi F, Qorbani M, Motlagh ME, Heshmat R, Ardalan G, et al. Association of hypertriglyceridemic-waist phenotype with liver enzymes and cardiometabolic risk factors in adolescents: the CASPIAN-III study. J Pediatr (Rio J). 2016;92:512–20.

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http://dx.doi.org/10.1016/j.jped.2015.12.009

components can be replaced by studying HW as a screening tool for identifying children at high risk for cardiometabolic disorders.

PALAVRAS-CHAVE
Cintura hipertrigliceridêmica;
Síndrome metabólica;
Crianças e adolescentes;
Perfil lipídico;
Teste da função hepática

Associação do fenótipo de cintura hipertrigliceridêmica com enzimas hepáticas e fatores de risco cardiometabólico em adolescentes: o estudo CASPIAN-III

Resumo

Objetivo: Este estudo visa investigar o desempenho da síndrome metabólica e do fenótipo de cintura hipertrigliceridêmica (CH) na determinação de fatores de risco cardiometabólico e enzimas hepáticas elevadas em uma amostra nacional da população pediátrica iraniana.

Método: Este estudo nacional foi realizado na estrutura da terceira pesquisa de um programa de vigilância. Foram recrutados alunos de 10-18 anos de 27 províncias do Irã. A prevalência de fatores de risco cardiometabólico foi comparada em alunos com e sem CH e SM. Foi determinada a associação da CH com diferentes fatores de risco cardiometabólico.

Resultados: A média de idade da população estudada foi de $14{,}73 \pm 2{,}41$ anos. A prevalência de CH e SM foi de 3,3% e 4%, respectivamente. 69 (71,1%) dos participantes com CH apresentaram SM. A prevalência de obesidade, pressão arterial sistólica elevada, hipercolesterolemia e ALT elevada foi significativamente maior em meninos e meninas com fenótipo CH e SM que em seus outros pares ($P < 0{,}05$). A associação de CH foi significativa com elevados níveis de colesterol e ALT, bem como obesidade e HDL-C baixo ($P < 0{,}05$).

Conclusões: Os achados atuais servem de evidência complementar de estudos anteriores, conduzidos principalmente com adultos, e sugerem que o fenótipo CH está associado a fatores de risco cardiometabólico, principalmente com colesterol e ALT altos. Propomos que, em ambientes de cuidados básicos e em grandes estudos epidemiológicas, a medição de todos os componentes de SM possa ser substituída pelo estudo da CH como ferramenta de triagem para identificar crianças com alto risco de apresentarem distúrbios cardiometabólicos.

Introduction

Non-communicable diseases, the leading cause of both mortality and morbidity in most populations, origin from early life.[1] A clustering of risk factors increases the risk of chronic diseases. Different combinations of risk factors are suggested to identify children at risk for non-communicable diseases. Metabolic syndrome (MetS) is one of these combinations that has been well documented as a predisposing factor for most chronic diseases. However, examining all five components of MetS in large population-based studies is difficult and costly. Moreover, there is substantial controversy between the various definitions of MetS and the clinical screening parameters and cut-off points proposed by different organizations.[2] Currently. there is no universally accepted definition for MetS in the pediatric age group. Therefore, simple screening indexes should be developed for population-based screening studies. Hypertriglyceridemic waist (HW), i.e. the coexistence of abdominal adiposity and hypertriglyceridemia, is a simple combination of risk factors.[3–5] Both MetS and HW were found to be associated with increased cardiometabolic risk, including insulin resistance, atherogenic dyslipidemia, hypertension, endothelial dysfunction, low-grade inflammation, and impaired hemostasis.[6,7]

Lemieux et al.[3] were the first authors to document the association of HW phenotype with increased cardiometabolic risk in adult men. In particular, the HW phenotype was associated with the atherogenic triad of hyperinsulinemia, elevated concentrations of apolipoprotein B. and small, dense low-density lipoprotein cholesterol (LDL-C) particles. Further studies confirmed the association of HW with cardiometabolic risk factors[8–10]; however, most of these studies have been conducted in adult populations.

A growing body of evidence suggests the association of liver function tests with MetS components. This correlation has been demonstrated even for children and adolescents.[11,12] There is limited experience on the association of HW phenotype with cardiometabolic risk factors and elevated liver enzymes in the pediatric age group.

This study aimed to compare the frequency of cardiometabolic risk factors and elevated liver enzymes in children and adolescence with HW phenotype and MetS, to investigate the performance of the HW phenotype in determining the aforementioned risk factors in this population.

Methods

This cross-sectional study was conducted in the framework of the third survey of a national school-based surveillance program entitled Childhood and Adolescence Surveillance and PreventIon of Adult Non-communicable disease (CASPIAN-III) study. Its detailed methodology has