Available online at www.sciencedirect.com
ScienceDirect
Metabolism Clinical and Experimental 56 (2007) 1011 – 1016
Metabolism
Clinical and Experimental
www.elsevier.com/locate/metabol

Plasma adiponectin concentrations and correlates in African Americans in the Hypertension Genetic Epidemiology Network (HyperGEN) study

James M. Shikany[a,*], Cora E. Lewis[a], Barry I. Freedman[b], Donna K. Arnett[c], Catherine Leiendecker-Foster[d], Tamekia L. Jones[e], David T. Redden[e], Albert Oberman[a]

[a]Division of Preventive Medicine, School of Medicine, University of Alabama at Birmingham, Birmingham, AL 35294, USA
[b]Department of Internal Medicine, School of Medicine, Wake Forest University, Winston-Salem, NC 27157, USA
[c]Department of Epidemiology, School of Public Health, University of Alabama at Birmingham, Birmingham, AL 35294, USA
[d]Department of Laboratory Medicine and Pathology, University of Minnesota, Minneapolis, MN 55455, USA
[e]Department of Biostatistics, School of Public Health, University of Alabama at Birmingham, Birmingham, AL 35294, USA

Received 25 September 2006; accepted 22 February 2007

Abstract

Adiponectin has demonstrated insulin-sensitizing, antiatherogenic, and anti-inflammatory properties, and may be an important risk factor for coronary heart disease and diabetes. Relatively few previous studies of plasma adiponectin have included sizable numbers of African Americans. The objective of the study was to investigate plasma concentrations of adiponectin and correlates of these concentrations in African Americans. This was a cross-sectional analysis that took place within the Hypertension Genetic Epidemiology Network. This study included 211 normotensive offspring (aged 22-37 years) of hypertensive siblings recruited by the Hypertension Genetic Epidemiology Network Birmingham, AL, field center. In addition to measuring plasma adiponectin, demographic and lifestyle data were collected, and anthropometric, clinical, and laboratory measurements were obtained. Mean plasma adiponectin concentration was 5.5 ± 3.8 μg/mL. Adiponectin was 55% higher in women than in men: 6.5 ± 4.4 vs 4.2 ± 2.5 μg/mL, respectively ($P < .0001$). In a multivariable analysis, high-density lipoprotein cholesterol concentration was positively associated and male sex and insulin concentration were negatively associated with plasma adiponectin concentration. Plasma adiponectin concentrations in these African Americans were lower than those reported in other racial/ethnic groups, including Japanese, whites, and Pima Indians. The directions of the associations of plasma adiponectin with other factors were in agreement with results in other racial/ethnic groups.

1. Introduction

Adiponectin is an adipocyte-derived peptide that exhibits insulin-sensitizing, antiatherogenic, and anti-inflammatory properties [1-3]. Adiponectin is present in relatively high concentrations in human plasma, accounting for approximately 0.01% of total plasma protein [4]. Plasma concentrations of adiponectin have been positively associated with age and have generally been shown to be higher in women compared to men [5]. It has been hypothesized that adiponectin may be the link between markers of inflammation, endothelial dysfunction, and obesity and risk of type 2 diabetes mellitus [6].

Plasma adiponectin has been inversely correlated with body mass index (BMI) and visceral adiposity [5] and is increased by weight loss [7,8]. Adiponectin has been negatively associated with insulin concentration in previous studies [7,9]. This inverse association may be mediated by adiponectin's insulin-sensitizing effects in tissues involved in glucose and lipid metabolism [10,11]. Hypoadiponectinemia may result in insulin resistance, increasing the risk of type 2 diabetes mellitus [12].

Hypoadiponectinemia may be a novel and important risk factor for coronary heart disease (CHD) [13]. Lower adiponectin concentrations have been associated with hypertension [14]. Adiponectin concentrations have shown inverse associations with plasma triglycerides [5,7,15] and positive associations with high-density lipoprotein (HDL) cholesterol [5,15]. Adiponectin has also shown inverse relationships with plasma C-reactive protein and other

* Corresponding author. Tel.: +1 205 975 7989; fax: +1 205 934 7959.
E-mail address: jshikany@dopm.uab.edu (J.M. Shikany).

0026-0495/$ – see front matter © 2007 Elsevier Inc. All rights reserved.
doi:10.1016/j.metabol.2007.03.020

markers of inflammation [6,16,17]. Because of the documented associations between adiponectin and multiple components of the metabolic syndrome, it has been speculated that adiponectin may play a key role in the development and prevention of this syndrome [10]. High plasma adiponectin concentrations are also associated with lower risk of myocardial infarction in men, independent of traditional risk factors [18].

Comparative studies of plasma adiponectin concentrations in populations with different propensity for obesity, insulin resistance, type 2 diabetes mellitus, and CHD are warranted [4]. Previous studies of concentrations and correlates of plasma adiponectin have been conducted primarily in Japanese [7,15-17,19,20], Pima Indians [4,6,11], whites [4,21], or in individuals of unreported race/ethnicity [5,14,22]. Less is known about plasma concentrations and correlates in African Americans, a population at particular risk of obesity, hypertension, and diabetes, although 3 cohort studies have reported adiponectin concentrations in African American adults [23-25]. The pool of subjects in the Hypertension Genetic Epidemiology Network (HyperGEN) Birmingham, AL, field center consists almost exclusively of African Americans. Unlike previous studies, this highly characterized population provided us with an opportunity to report on plasma concentrations of adiponectin and correlates of these concentrations in African Americans predisposed to hypertension.

2. Methods

2.1. The HyperGEN study

The Hypertension Genetic Epidemiology Network has as its core objective to detect and characterize genes promoting hypertension in humans. Details on methodology and recruitment in HyperGEN have been published elsewhere [26]. Briefly, this collaborative network is composed of the National Heart, Lung, and Blood Institute (NHLBI) and 4 field centers from the population-based NHLBI Family Heart Study—Framingham, Minneapolis, Salt Lake City, and Forsyth County, NC—and a fifth field center in Birmingham, AL, to ensure that African Americans represented more than one half of the sample size. Three categories of subjects were recruited during phase I of HyperGEN between 1996 and 1999: a sample of severe and mild hypertensive sibships (n = 2407); a random sample of age-matched persons from the same base populations, from which normotensive controls could be drawn (n = 918); and unmedicated, normotensive adult offspring of one of the hypertensive siblings (n = 515).

2.2. Subjects

Of the 515 normotensive offspring enrolled in the study, 257 were African American. This included 211 African American subjects enrolled at the Birmingham field center, which was the subsample included in this analysis. In addition to the routine measurements performed in all HyperGEN subjects, plasma adiponectin concentration was measured in subjects in this subsample. The study was conducted in accordance with the guidelines in the Declaration of Helsinki. The study was approved by the Institutional Review Board for Human Use at the University of Alabama at Birmingham, and all subjects gave informed consent.

2.3. Clinical examination

Subjects attended a clinical examination at the field center for questionnaire administration, clinical measurements, and collection of blood and urine samples for laboratory measurements.

2.4. Personal history

Personal history data, including basic demographic information (eg, sex, age, race), smoking history, and alcohol use, were collected through an interviewer-administered questionnaire. Current smoking and alcohol use were 0/1 (no/yes) variables that recorded whether a subject currently smoked cigarettes or drank alcohol.

2.5. Clinical measurements

Height was measured on a wall-mounted stadiometer, and weight was measured on a balance-beam scale. Waist circumference was measured with a constant-tension tape measure at the level of the umbilicus. Blood pressure was measured using an automated device (Dinamap model 1846 SX/P; Critikon, Tampa, FL). All measurements were performed by trained and certified personnel according to written protocols.

2.6. Laboratory assays

A 12-hour fasting blood sample and 12-hour overnight timed urine sample were collected from all subjects. Total adiponectin concentration in EDTA plasma was measured with a solid-phase ELISA method (Human Adiponectin/Acrp30 Quantikine ELISA kit, no. DRP300; R&D Systems, Minneapolis, MN). The reliability coefficient for adiponectin measurements based on blind duplicate samples was 0.87. Serum glucose was measured by a thin-film adaptation of a glucose oxidase enzymatic, spectrophotometric procedure using the Vitros 700 Chemistry Analyzer (Johnson & Johnson Clinical Diagnostics, Rochester, NY). Serum insulin was measured using a chemiluminescent, immunoenzymatic method on an Access analyzer (Beckman Coulter, Brea, CA). Insulin resistance (IR) was estimated with homeostasis model assessment (HOMA) as [fasting serum glucose (mmol/L) × fasting serum insulin (μU/mL)]/22.5 [27]. Creatinine in serum and urine was measured by a thin-film adaptation of the amidohydrolase enzymatic, spectrophotometric method using the Vitros analyzer. Albumin in urine was measured by a thin-film adaptation of a bromcresol green colorimetric procedure using the Vitros analyzer. Serum uric acid was measured by a thin-film adaptation of a uricase enzymatic, spectrophotometric method using the Vitros analyzer. Plasma