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Cardiometabolic health in Asians with diabetes in the US

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ABSTRACT

Aims: Asians develop diabetes at lower levels of adiposity than people of other race/ethnicities. However, there is limited data investigating the health of US Asians with diabetes. We compared cardiovascular risk factors in US Asians to other race/ethnicities stratified by diabetes status.

Methods: Among 4645 adults in the 2011–2014 National Health and Nutrition Examination Survey (NHANES), a cross-sectional survey of the US population, odds ratios were calculated for obesity, hypertension, and elevated low-density lipoprotein (LDL) cholesterol associated with race/ethnicity after adjustment for age, sex, income, education, smoking, alcohol consumption, and health insurance.

Results: Overall and stratified by diabetes status, non-Hispanic whites, non-Hispanic blacks, and Mexican-Americans were significantly more likely to be obese compared to non-Hispanic Asians after adjustment. Overall and stratified by diabetes status, adjusted levels of hypertension compared to non-Hispanic Asians was generally similar for non-Hispanic whites and Mexican-Americans and generally more common among non-Hispanic blacks; among those with diagnosed diabetes, the adjusted odds ratios (95% confidence interval) were 1.48 (0.79–2.77), 2.54 (1.49–4.30), and 1.38 (0.73–2.60) for non-Hispanic whites, non-Hispanic blacks, and Mexican-Americans, respectively. Overall and stratified by diabetes status, elevated LDL cholesterol levels were generally similar between non-Hispanic Asians and other race/ethnicities; among those with diagnosed diabetes, the adjusted odds ratios (95% confidence interval) were 0.88 (0.32–2.43), 0.58 (0.24–1.42), and 1.15 (0.29–4.58) for non-Hispanic whites, non-Hispanic blacks, and Mexican-Americans, respectively.

Conclusions: Although non-Hispanic Asians had lower levels of adiposity compared to other race/ethnicities with diabetes, their adjusted levels of hypertension and LDL cholesterol were generally more comparable.

1. Introduction

In the US, the prevalence of diabetes among Asians was 21% in 2011–2012, which was similar to non-Hispanic blacks and Hispanics and considerably higher than the 11% prevalence found among non-Hispanic whites [1]. The relatively high prevalence among Asians occurs despite a lower body mass index (BMI) compared to other race/ethnic groups. Similarly,

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previous research found that Asians have a higher prevalence of diabetes at a given waist circumference [2]. This may partly explain why Asians with diabetes in the US are more likely to be undiagnosed than other race/ethnicities, with approximately half unaware of their diabetes, compared to approximately one-third among non-Hispanic whites and non-Hispanic blacks [1]. Despite these substantial differences, there is limited data investigating other aspects of cardiometabolic health among Asians with diabetes in the US. In a study of Veterans Affairs patients with diabetes, Asians had lower levels of glucose control than whites, but there was no difference in cholesterol or blood pressure control [3]. In another study of patients with diabetes in public hospitals, Asian patients had lower levels of glucose control and cholesterol control than white patients [4].

We sought to characterize clinically important cardiovascular risk factors that are routinely assessed in basic medical examinations, including body mass index, blood pressure, and low-density lipoprotein (LDL) cholesterol in US Asians in the general population stratified by diabetes status, and to compare levels of these risk factors to other race/ethnicities. To do so, we used data from the 2011–2014 National Health and Nutrition Examination Survey (NHANES).

2. Materials and methods

2.1. Study participants

NHANES is a series of stratified, multistage probability surveys designed to be representative of the US civilian, noninstitutionalized population [5]. NHANES continuously collects data in 2-year cycles since 1999. We limited our analysis to the 2011–2014 years because those were the only years that Asians were oversampled to provide sufficient sample size for precise estimates. The data are collected via an in-home interview and a visit to a mobile examination center. The response rate was 73% and 71% for the interview and 70% and 69% for the examination in 2011–2012 and 2013–2014, respectively. Participants were randomly selected to participate in a morning examination for which they were asked to fast or to an afternoon/evening examination. We used data from the morning sessions. Of 5315 adults ≥20 years of age, we excluded pregnant women (n = 6) and those who self-reported being 'other race/ethnicity' comprising subgroups with insufficient statistical power for analysis (n = 664). The final sample for our analysis was 4645 participants, including 2095 non-Hispanic whites, 1197 non-Hispanic blacks, 679 non-Hispanic Asians, and 674 Mexican-Americans.

The protocol for the 2011–2014 NHANES was approved by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention research ethics board. All participants gave written informed consent.

2.2. Data collection

During the in-home interview, standardized questionnaires were used to collect information regarding age, race/ethnicity, sex, education, income, smoking status, alcohol consumption, health insurance, and medication use. A previous diagnosis of diabetes was determined based on a self-reported diagnosis by a doctor or other health professional.

During the examination, height and weight were measured and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Obesity was defined as having a BMI ≥ 30 kg/m^2. Waist circumference was measured at the iliac crest and abdominal obesity was defined as a waist circumference >102 cm in men and >88 cm in women. Participants had their blood pressure measured up to three times and hypertension was defined as an average systolic blood pressure ≥140 mmHg, or an average diastolic blood pressure ≥90 mmHg, or current use of antihypertensive medication.

A trained phlebotomist obtained a blood sample according to a standardized protocol. Participants fasted overnight for at least 8 h (they were excluded if they reported fasting for >24 h). LDL cholesterol was estimated using the Friedewald equation [6] based on measured total cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides. Elevated LDL cholesterol was defined as having LDL cholesterol ≥100 mg/dL or use of lipid-lowering medication.

A1c was measured using a Tosoh G7 Automated HPLC Analyzer or a Tosoh Automated Analyzer HLC-723G8 (Tosoh Medics, Inc, San Francisco, CA), which had a reportable range of 3.0–19.0% (9–184 mmol/mol) and 3.1–19.5% (10–190 mmol/mol), respectively. The interassay coefficient of variation ranged from 0.4% to 1.3%. Eligible participants were administered a 75 g (or a calibrated dose for participants weighing <94 lb) glucose load (Trutol) oral glucose tolerance test (OGTT) and a blood sample was drawn 2 h later. Fasting and 2-h glucose were measured in plasma by a hexokinase method using a Roche Modular P Chemistry Analyzer or a Roche Cobas C Chemistry Analyzer (Roche Diagnostics, Indianapolis, IN). The interassay coefficient of variation ranged from 0.9% to 3.8%. Undiagnosed diabetes was defined as not having a previous diagnosis of diabetes and having either an A1c level of ≥6.5% (48 mmol/mol), a fasting plasma glucose level of ≥126 mg/dL, or a 2-h plasma glucose level of ≥200 mg/dL. Prediabetes was defined as not having diabetes and having an A1c level of 5.7–6.4% (39–47 mmol/mol), a fasting glucose level of 100–125 mg/dL, or a 2-h glucose level of 140–199 mg/dL.

2.3. Statistical methods

We calculated percentages (standard errors) of participant characteristics by race/ethnicity (non-Hispanic Asian, non-Hispanic white, non-Hispanic black, and Mexican-American). After stratifying by diabetes status and race/ethnicity, we used conditional margins to calculate the unadjusted and adjusted mean BMI and LDL cholesterol using linear regression and the percentage with hypertension using logistic regression. Adjustment included age, sex, income, education, smoking, alcohol consumption, health insurance, and BMI (except for BMI analysis). We then calculated the odds ratios of obesity, hypertension, and elevated LDL cholesterol associated with race/ethnicity overall and stratified by diabetes status using adjustment as described above.

For all analyses, appropriate sample weights were used so that the sum of the sample weights (MEC, fasting, and OGTT weights) added to the total civilian non-institutionalized US