C. Obesity and Cardiovascular Disease Risk Factors Are Ethnicity Based: A Study of Women of Different Ethnic Backgrounds in Southeastern Michigan

Wael Hatahet, PhD; Thomas V. Fungwe, PhD

Introduction

Within the last decades, the prevalence of obesity in the United States has risen for all women 20 to 74 years of age.[1] Obesity has negative effects on lipoprotein metabolism, and weight gain is often accompanied by elevation in blood glucose, triglyceride, and hypertension, which play an important role in the development of cardiovascular disease (CVD).[2] According to the Center for Disease Control (CDC), more than 60% of women who suffer a stroke die within eight years. Of those who die from a stroke each year, approximately 61% are females, and among the women who have died from a heart attack, 63% had had no previous evidence of the disease.[3] Consequently, more than half of the annual healthcare costs related to cardiovascular diseases are attributed to women.

Background

In Michigan, more than 70,000 women died of heart diseases between 1991–1995, with a death rate of 442 per 100,000.[3] Contributing significantly to that health problem is the evidence of growing obesity. A recent survey targeted Michigan as the third "fattest" state in the United States and the Detroit-area as number one. Obesity is definitely a risk factor for heart disease and is more prevalent in women then men.[4] Some data suggest that obesity is more prevalent among ethnic and racial minorities. This study evaluated body mass index (BMI) as well as other known risk factors for CVD among African-American, Caucasian, and Arab-American women. Emphasis was placed on the latter group, in part, because they constitute a growing population of new immigrants with limited available information on their risk for CVD.[5]

Methods

Design and Sample

This study involved community-based screening and evaluation to determine the risk of CVD among ethnic/racial minority women in Southeast Michigan. Recruitment of subjects occurred over a three-year period through advertisements in local community centers, on radio stations, and on flyers distributed at a local art fair. Ethnicity was determined by self-report. A convenience sample of 733 women was screened.

Measurements and Data Collection

Body Fat and Body Mass Index Measurements

Height was measured without shoes (to the nearest 0.1 inch). Total body fat and body mass index (BMI) were measured using the Tanita Body Fat analyzer (Tanita Corporation, Skokie, Ill.) as previously reported.[5]

Hypertension Measurements

Subjects were seated and adult cuffs were used to assess the brachial artery blood pressure; systolic and diastolic blood pressures were measured.

Blood Lipid and Glucose Measurements

Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-

From the Department of Nutrition and Food Science, Wayne State University, Detroit, Michigan.

Table 1. Correlation of risks for cardiovascular disease among women of different ethnic background

Ethnicity	TC	TG	HDL	LDL	GLU	SYS	DIA	BMI	% Fat
African American	5.62 ± 0.06[a]	1.29 ± 0.6[a]	1.58 ± 0.03[a]	3.73 ± 0.42[a]	6.45 ± 0.12[a]	120.0 ± 1.0[a]	78.4 ± 0.7[a]	31.1 ± 0.4[a]	45.5 ± 0.7[a]
Caucasian American	5.25 ± 0.07[b]	1.48 ± 0.11[a]	1.52 ± 0.03	3.44 ± 0.18[a]	6.03 ± 0.11[b]	117.1 ± 0.9[b]	76.1 ± 0.7[b]	26.6 ± 0.5[b]	34.7 ± 0.7[b]
Arab American	4.77 ± 0.09[c]	1.64 ± 0.16[b]	1.23 ± 0.04[b]	2.79 ± 0.14[a]	6.06 ± 0.18[ab]	112.3 ± 1.7[c]	63.5 ± 1.2[c]	27.0 ± 0.6[b]	38.15 ± 1.1[c]

Means with different letters are significantly different at P<0.01 or less. TC = total cholesterol; TG = triglycerides; HDL-C = high density lipo-protein cholesterol; LDL-C = low density lipo-protein cholesterol; GLU = glucose; SYS = systolic BP; DIA = diastolic BP; GLU = blood glucose levels.

C), triglyceride (TG), and glucose levels were obtained from the blood by finger prick and determined as previously reported.[5] The cut off for cholesterol concentration was 5.2 mmol/L (borderline high) and postprandial blood glucose cut off was 7.7 mmol/L for most participants in accordance with the World Health Organization guidelines.[6]

Data Analysis

All data collected were entered directly onto a standardized recording form using Excel 5.0 (Microsoft, Redmond, Wash) and later exported to SPSS 9.0 (SPSS Inc., Chicago, Ill) for analysis. A descriptive analysis including means, percentages, and correlation was conducted. The association between age, blood glucose, BMI, percentage of body fat, hypertension, and blood lipid parameters were examined using regression analysis.

RESULTS

The distribution of participants based on ethnicity was as follows: 128 Arab-American (ArA) women, 322 African American (AA) women, and 283 Caucasian (CA) women. On average ArA women were approximately 10 years younger than their AA or CA counterparts. The average BMI was 27 for ArA, 31.04 for AA, and 26.6 for CA women (Table 1). More than 29% of ArA women had a BMI >30, compared to 55% and 24% of AA and CA women, respectively. Body fat levels >30% were evident among all groups. In fact, more than 74% of ArA, 89% of AA, and 62% of CA women had body fat percentages >30%. Lipid profiles, blood pressure measurements, and total body compositions are in Table 1. Lower levels of high-density lipoprotein cholesterol (HDL-C) are considered a risk factor for heart disease. In addition, the TG/HDL-C concentration ratio provides an independent estimate of CHD risk.[7] To determine which serum lipid components affected CVD the most in the three ethnic populations, the concentration of TC, TG, and LDL-C were expressed as ratio of HDL-C (Figure 1). If the relative index of risk is considered to be 1.0, LDL-C and total cholesterol did not significantly affect HDL-C in the three populations. However, TG was shown to affect the HDL-C negatively, and TG:HDL-C ratio was significantly (P=.01) higher in ArA women than AA or CA women.

Regression analysis showed that age predicted TC in AA and CA, but not in ArA women. When age was adjusted for BMI, percentage of body fat predicted HDL-C in AA and CA women, but not in ArA women. Percentage of body fat supported glucose as a risk factor in ArA women, but not in the other two groups. Triglyceride concentrations were shown to be strong predictors of glucose in CA and ArA women. Although percentage of body fat was related to systolic blood pressure in ArA and CA, it failed to predict systolic blood pressure in AA women.

DISCUSSION

To better understand the presence of risk factors for CVD in women, parameters such as blood lipids, blood glucose levels, hypertension, and obesity were evaluated. These parameters are believed to predict heart disease and stroke.[8,9] In the present study, ArA had mean BMI comparable to that of CA women; their BMI was lower than that of AA women. This observation cannot be generalized because African-American women in this study had higher ratios of obesity than the national average, while CA women had rates similar to the national average. On one hand, mean BMI for ArA in this study may not be a true representation because ArA women surveyed in this study were, on average, 10 years younger than their AA and CA counterparts. A previous study showed that ArA women 50 years or older had an average BMI of 33.[5] In the present study, mean percentage of body fat was shown to be >30% in all groups, with AA women taking the lead, followed by ArA and CA women, 47%, 38%, and 35%, respectively.

Elevations in triglyceride levels in ArA women were accompanied by reductions in HDL-C levels. In fact, HDL-C levels were lowest for ArA and similar for both AA and CA women. This finding might be of significance, considering the relationship of plasma HDL-C level and cardiovascular risk is inverse, with the risk rising sharply when the levels are <0.9 mmol/L.[10] The elevated levels of TG and high TC:

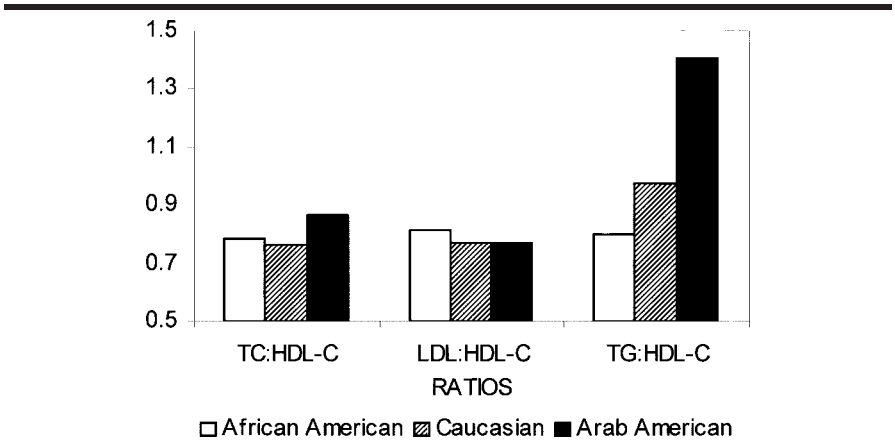

Fig 1. Ratios of total cholesterol (TC) and low density lipo-protein cholesterol (LDL-C) to high density lipo-protein cholesterol (HDL-C) and triglycerides (TG) to high density lipo-protein cholesterol (HDL-C) as a function of risk. Relative risks of 1—based on TC:HDL-C of 4.5, LCL:HDL-C of 3, and TB: HDL-C of 3

HDL-C ratios in ArA women suggest that TG affected TC : HDL-C levels (Figure 1). This finding was confirmed by strong correlation (r=0.74) between TG concentration and TC : HDL-C ratios in ArA women. The elevated levels of TG : HDL-C ratios in this population might explain the higher prevalence of diabetes and glucose intolerance among adult Arab Americans in Michigan reported by Jaber et al.[11]

CONCLUSIONS

To the best of our knowledge, this study is the first that directly identified triglyceride levels and TG : HDL-C as risk factors to heart disease unique in this particular population. The lack of correlation between total cholesterol and other risk factors for cardiovascular disease indicate that TC may be far less important than other risk factors such as triglyceride and glucose levels. It may be a unique identifier of risk to cardiovascular disease in some ethnic populations such as in Arab-American women. Finally, further studies with randomly selected samples are needed to establish an independent CVD risk profile based on ethnicity that takes into account diet and physical activity.

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