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Dyslipidemia according to gender and race: The Brazilian Longitudinal Study of Adult Health (ELSA-Brasil)

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BACKGROUND: There is little information regarding lipid profiles of racially mixed populations. Differently from other Latin American countries, the proportion of African ancestry is much higher in Brazil.

OBJECTIVE: Verify whether there are differences in the lipid profile between black and white subjects and if people with mixed ancestry have a pattern more closely resembling whites or blacks.

METHODS: A total of 15,105 civil servants aged 35–74 years from the ELSA-Brasil study had their fasting lipid profile determined. Race/skin color was self-reported as white, mixed, black, Asian, or indigenous. Dyslipidemia subtypes were classified as high triglycerides (TG) (≥150 mg/dL), low HDL-C (<40 [men] and <50 [women] mg/dL), and high LDL-C (≥130 mg/dL or ever taking lipid-lowering agents). The adjusted odds ratios (95% confidence interval) for dyslipidemia were calculated for each racial group using white participants as the reference group by logistic regression.

RESULTS: Elevated concentrations in LDL-C and TG and low-HDL-C had a lower prevalence in the black group compared with whites after multivariate adjustment including adiposity and socioeconomic status. For women and men, respectively, the odds ratios (95% confidence interval) for high LDL-C are 0.94 (0.89–0.99) and 0.93 (0.87–0.99); for high TG, 0.63 (0.54–0.74) and 0.92 (0.84–1.00); and for low HDL-C, 0.77 (0.66–0.91) and 0.78 (0.64–0.94). The mixed race group presented a pattern of dyslipidemia closer to white than to black subjects.

CONCLUSIONS: Blacks in comparison with whites had lipid concentrations that are associated with a lower risk of atherosclerotic cardiovascular disease. The mixed racial group had lipid concentrations closer to the white grouping.

Introduction

Dyslipidemia including high blood levels of low-density lipoprotein (LDL-C), triglycerides (TG), and low levels of high-density lipoprotein (HDL-C) is among the leading causes of atherosclerotic cardiovascular diseases worldwide.[1] The prevalence of high cholesterol is higher in Australasia, North America, and Western Europe compared with other regions of the world. However, these former regions have experienced a downward trend in the prevalence rates between 1980 and 2008. In contrast, the rates of high cholesterol are rising in Eastern Europe, Southeastern Asia, and other Pacific regions while remaining constant in other regions of the

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world.[2] In addition to geographical differences, there is significant heterogeneity of dyslipidemia prevalence rates according to racial/ethnic backgrounds within the same society, as well as the relationship to cardiovascular mortality rates and the use of lipid-lowering agents.[3,4]

In this context, it is interesting to verify different patterns of dyslipidemia distribution in racially mixed societies, such as in Latin America and the Caribbean. In Brazil, during the 2010 National Census, 47.7% self-referred as white, 43.1% as mixed, 7.6% as black, 1.1% as Asian, and 0.4% as indigenous.[5] Several ancestry surveys performed in Brazil revealed that people who self-referred as mixed had approximately 55% genes of European, 30% of African, and 15% of Amerindian origins.[6–10] However, there is a significant difference of the racial admixture in Brazil compared with other countries such as Chile, Colombia, and Mexico. The proportion of African ancestry is much higher in Brazil than in these other countries, and the frequency of Amerindian ancestry is much lower than in Brazil than in Chile, Colombia, and Mexico.[11]

In 2010, the highest age-adjusted cardiovascular death rates were among black men and women, whereas white and mixed persons had similar mortality rates. For coronary heart disease, persons who self-declared as mixed had the lowest death rates.[12]

Previously, we identified among the 15,105 participants aged 35–74 years of the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil) the proportion of people who required reduction of the LDL-C according to the criteria of the 2004 update of National Cholesterol Education Program Adult Treatment Panel III (ATP-III).[13] By that, we identified slightly higher frequency rates adjusted for age, sex, income, and education attainment of high LDL-C among blacks compared to white (3%) and no differences among white, mixed, Asians, and indigenous.[14]

The aim of the present study is to verify if the apparent paradox observed in the United States for blacks where there is an unfavorable coronary heart disease mortality pattern and a favorable lipid profile occurs in Brazil, and if mixed people have a pattern more closely resembling whites or blacks.[15–20] To test these, we applied to the ELSA-Brasil baseline the design elaborated by Frank et al.[3] that analyzes dyslipidemia according to ethnicity, sex, income, previous cardiovascular disease, and the presence of diabetes.

Methods

Study recruitment

ELSA-Brasil addresses the incidence of cardiovascular diseases and significant associated risk factors; the design and preliminary findings of this study are available elsewhere.[20–22] Briefly, 15,105 civil servants aged 35–74 years from six cities in Brazil (Belo Horizonte, Porto Alegre, Rio de Janeiro, Salvador, Sao Paulo, and Vitoria) were enrolled between August 2008 and December 2010 for baseline examination. All six participating centers approved the ELSA-Brasil protocol, and all participants granted informed consent.

Data collection

Interviews and examinations at each site were carried out by trained personnel with strict quality control. The questionnaire addressed sociodemography, lifestyle, morbidity, psychiatric profile, diet, and medicines under use. Race/skin color was self-reported as white, mixed, black, Asian, and Indigenous. Smoking status was defined as never, former, or current. Education was categorized as elementary, high school, or college. Annual household income was converted to United States dollars from Brazilian reals. All participants described past medical diagnoses of myocardial infarction, stroke, heart failure, or coronary revascularization. All prescription and over-the-counter pill bottles were examined to confirm that medications were taken during the 15-day period preceding the interview.

Trained nurses measured subject weight, height, sitting height, waist, and hip and neck circumferences, and they performed standardized physical examinations. Body mass index was calculated by dividing the patient's weight in kilograms by their height in meters squared.

High blood pressure was defined regarding three criteria: systolic blood pressure $\geq$140 mmHg, diastolic blood pressure $\geq$90 mmHg, or the use of medication to control hypertension. Diabetes was defined as a report of a previous medical diagnosis of diabetes, the use of medication for diabetes, or meeting a diagnostic cutoff for diabetes according to fasting or 2-hour plasma glucose levels obtained as part of a 75-g oral glucose tolerance test or the glycated hemoglobin test.

Lipid measurement and definitions of dyslipidemia

All blood samples were collected after a 12-hour fasting, and aliquots for the test performance were stored in freezers at -80°C until the date of transportation to the Central Laboratory for analysis by an ADVIA 1200 (Siemens) equipment. The LDL-C was estimated by the Friedewald equation when triglycerides were $<$400 mg/dL, and when TG were $>$400 mg/dL by a homogeneous, enzymatic assay, without precipitation.[22]

Dyslipidemia subtypes were classified as: high TG ($\geq$150 mg/dL), low HDL-C ($<$40 [men] and $<$50 [women] mg/dL), and high LDL-C ($\geq$130 mg/dL or ever taking lipid-lowering agents) and are described separately in the analysis. In the text, when we used the expression dyslipidemia, we are referring to a combination of the three dyslipidemia subtypes. In ELSA-Brasil, 13.1% of participants were using LDL-lowering agents. Most of them were taking statins.[14]

Sampling and statistical analysis

For the comparison among races, we calculated the age-adjusted prevalence rates of dyslipidemia subtypes (high