Contents lists available at SciVerse ScienceDirect

Primary Care Diabetes

journal homepage: http://www.elsevier.com/locate/pcd

Original research

Racial differences in HbA_{1c}: A cross-sectional analysis of a Brazilian public primary care population

Veronica A. de Miranda[a], *Rubens A. Cruz Filho*[b], *Talita Sposito de Oliveira*[c], *Samuel D. Moscavitch*[c], *Hye C. Kang*[d], *Soraya V. Miranda Chagas*[c], *Daniela M. Costa*[c], *Denizar Vianna Araújo*[e], *Maria Luiza Garcia Rosa*[c,*]

[a] *Universidade Federal do Rio de Janeiro, Rua Aloísio da Silva Gomes, 50 - Granja dos Cavaleiros, Macaé, RJ - CEP 27930-560, Brazil*
[b] *Universidade Federal Fluminense, Department of Internal Medicine, Rua Marques do Parana 303, 6° andar, Niteroi, RJ - CEP 24030-21, Brazil*
[c] *Universidade Federal Fluminense, Department of Epidemiology and Bioestatistics, Rua Marques do Parana 303, 3° andar do prédio anexo, Niteroi, RJ - CEP 24030-21, Brazil*
[d] *Universidade Federal Fluminense, Department of Pathology, Rua Marques do Parana 303, 4° andar, Niteroi, RJ - CEP 24030-21, Brazil*
[e] *Universidade do Estado do Rio de Janeiro, Centro Biomédico, Department of Clinical Medicine, Boulevard 28 de setembro n° 77, 3° andar - sala 329 Vila Isabel - CEP 20551-030, Rio de Janeiro, Brazil*

ARTICLE INFO

Article history:
Received 25 January 2012
Received in revised form
25 January 2013
Accepted 28 January 2013
Available online 26 February 2013

Keywords:
HbA_{1c}
Skin color
Familial aggregation
Brazil
Diabetes
Hypertension

ABSTRACT

Background: Blacks show higher levels of HbA_{1c} in studies with different populations and are disproportionately affected by most diabetes-related complications.
Aims: The study aims to investigate if the prevalence of altered glycated hemoglobin (HbA_{1c}) varies with skin color and if there is a familial aggregation of either skin color and HbA_{1c}.
Methods: The study used the CAMELIA study (Cardio-Metabolic-Renal familiar) population, conducted between June 2006 and December 2007 (cross sectional). Families were recruited from 13 Family Doctor Program Unities of Niteroi, Brazil, a highly miscegenated population. The visits included questionnaire, medical consultation, anthropometric and nutritional assessment. Blood pressure, blood/urine samples were collected. The dosage of HbA_{1c} was performed by immunoturbidimetry in Labmax 240 equipment.
Results: We compare data of 241 (25.5%) Blacks, versus 422 (44.7%) Mulattos or 272 (28.8%) Whites. The groups did not differ significantly with regard to most measures. Blacks had the lowest levels of income/education, higher frequency of diabetes and hypertension ($p < 0.20$) as higher levels of HbA_{1c} ($p < 0.05$) that persisted after adjusting for possible confounders. Among blacks, the correlations between siblings of HbA_{1c} were higher than among white/mulatto, reaching 86% versus 50%, respectively.

* *Corresponding author at*: Rua Marques do Parana 303, 3° andar do prédio anexo, Niteroi, Rio de Janeiro, CEP 24030-21, Brazil. Tel.: +55 2122460364; fax: +55 2126299351.
E-mail addresses: veronicaalcoforado@hotmail.com (V.A. de Miranda), rubensacfilho@gmail.com (R.A. Cruz Filho), talitasposito@gmail.com (T.S. de Oliveira), moscavitch@yahoo.com.br (S.D. Moscavitch), hyekang@vm.uff.br (H.C. Kang), sorayachagas.nutricionista@gmail.com (S.V. Miranda Chagas), daniela.demc@gmail.com (D.M. Costa), denizar@cardiol.br (D. Vianna Araújo), mluizagr@gmail.com (M.L. Garcia Rosa).
1751-9918/$ – see front matter
http://dx.doi.org/10.1016/j.pcd.2013.01.007

Conclusion: Those results indicate that Brazilian Blacks patients must have more attention, focusing on diabetes preventive care. Longitudinal studies are needed to address the question if the altered level of HbA_{1c} has a real clinical impact.

1. Introduction

Several studies have established that HbA_{1c} can vary with race/ethnicity, age, gender, pregnancy and genetics, independently of glycemia [1–3]. And studies that were carried out with different populations have suggested that levels of HbA_{1c} are higher in Blacks [3]. Moreover, type 2 diabetes has a high heredity component (estimated to be >50%), which is indicated by the high rates of concordance between monozygotic twins [4] and the heritability [5].

Ethnic minorities in the U.S. are disproportionately affected by most diabetes related complications [6]; this was not observed in a Brazilian study [7]. There is a lack of published articles concerning the levels of HbA_{1c} in the Brazilian population, especially with regard to the race-related differences. Brazilians are considered to be one of the most mixed-race populations in the world, which results from five hundred years of interethnic unions between Amerindians, Europeans and Africans [8].

This study selected its participants from the families enrolled in the Family Doctor Program (FDP) of Niteroi, Rio de Janeiro, Brazil. It is a primary care program of the public health system that assists families with low-income who live in underprivileged areas (approximately 25% of the municipality population) [9]. The present study aims to investigate if among the Brazilian population there is a significant difference between skin color (racial/ethnic) and prevalence of altered HbA_{1c}; if there exists' a familial aggregation of HbA_{1c} and if it will vary according to skin color groups.

2. Methods

This study is a part of The CAMELIA study (Cardio-Metabolic-Renal familiar). Between June 2006 and December 2007 a total of 1098 subjects were recruited from 13 FDP units selected by convenience and covering all administrative areas of Niteroi. The protocol was approved by the Ethics Committee of the Medical School of Universidade Federal Fluminense. Informed written consent was obtained from all participants. In order to be accepted, the proband and his/her partner had to agree to participate on the study and they must bear one or more son/daughter ranging from 12 to 30 years of age, who would also be enrolled. Four groups of probands were recruited: (1) hypertensive patients without diabetes; (2) diabetic patients with hypertension; (3) diabetic patients without hypertension; and (4) patients without either hypertension or diabetes. Probands were randomly selected from the subjects who met the inclusion criteria. Pregnant women and those with immunodeficiency or on immunosuppressive agents (steroids and/or cytostatic drugs) were excluded. The participants answered a questionnaire and provided blood and urine samples. Nutritionists assessed anthropometric and nutritional status. Blood pressure was measured using an electronic sphygmomanometer (Hem-711AC, Omron Co., Japan) [10]; three measurements were taken, and the mean of the second and third measurements was considered. Biochemical analyses were carried out using a chemistry analyzer (Selectra, Vital Scientific NE, Netherlands).

The present study included only the participants' from the Camelia Study who had recorded measurements of fasting blood glucose, glycated hemoglobin and evaluation of skin color (935 individuals). The Geography and Statistics Brazilian Institute's official classification (IBGE) [11] for race/skin color in Brazil was adopted and it divides the population into five categories: White [Branco], Mulatto [Pardo], Black [Preto], Yellow and Indigenous (no Yellow or Indigenous were sampled in the Camelia Study). The monthly income per capita was sorted into three categories: US$100.00, between US$100.00 and 200.00 and >US$200.00. The minimum monthly wage in Rio de Janeiro State during 2006–2007 was approximately US$200.00. The participants' education level was divided into three strata: 'Low' (never studied or studied until fourth grade), intermediate (studied past the fourth grade, until the 10th grade) and 'studied past the 10th grade'. Participants completed a questionnaire on leisure-time physical activity. Those who reported <150 min of physical activity were considered sedentary. They were classified as non-smokers, ex-smokers or current smokers. The alcohol consumption was sorted as low risk, if less than 14 units of alcohol per week for women and less than 21 units of alcohol per week for men; moderate risk, if consumption ranged from 15 to 35 units of alcohol per week for women and 22–50 units of alcohol per week for men; and, high risk, if more than 35 units of alcohol per week for women and more than 50 units of alcohol per week for men. Body mass index (BMI) was calculated as a ratio of body weight (in kg) and squared height (in meters). People who referred previous medical diagnosis of hypertension or diagnosis of diabetes were classified as having hypertension or/and diabetes respectively. Studied biochemical variables included: HbA_{1c}, total cholesterol (TC), LDL-cholesterol (LDL-c), HDL-cholesterol (HDL-c), triglycerides (TG) uric acid, glycemia and insulin. These metabolic parameters were analyzed as continuous variables. The biochemical measurements were taken at the Laboratory of João Vizela Basic Health Unit of the Municipal Health Foundation of Niteroi and at Antonio Pedro University Hospital (HUAP). The quantification of HbA_{1c} was carried out by immunoturbidimetric method [13]. Urine and serum samples were stored in a freezer at $-80^{O}C$, in HUAP's Blood Bank service. The amount of serum glucose, TC, HDL-C and TG were measured using the commercial kits of the equipment Selectra Wiener® brand. Insulin measurements were taken with the Human serum adipokine panel B Milliplex® map kit from Millipore. The data was acquired with Luminex® equipment and analyzed with xMAP® program. The hematologic parameters were attained with STKS Coulter Counter