Association between race, obesity and diabetes in elderly community dwellers: data from the FIBRA Study

Associação entre cor/raça, obesidade e diabetes em idosos da comunidade: dados do Estudo FIBRA

Asociación entre color/raza, obesidad y diabetes, en ancianos de la comunidad: datos del Estudio FIBRA

Maria Clara Moretto [1]
Anne Marie Fontaine [2]
Cássia de Almeida Merlo Sarzedo Garcia [1]
Anita Liberalesso Neri [1]
Maria Elena Guariento [1]

Abstract

*This study sought to investigate the effect of race on measures of body fat (body mass index – BMI, waist circumference – WC and waist-hip ratio – WHR), as well as its relationship with diabetes, among elderly individuals living in urban areas in seven places in Brazil, according to gender. This is a cross-sectional study carried out with a probabilistic sample comprising 2,566 individuals with 65 years of age or more who participated in the FIBRA Study (*Frailty in Elderly Brazilians*). We used several self-reported sociodemographic variables (gender, age, race, schooling and family income), anthropometric measures of general (BMI) and abdominal obesity (WC and WHR) and self-reported diabetes. Adjusting for schooling and income, white race was associated with higher WC values (p = 0.001) and WHR (p > 0.001) for male gender, regardless of diabetes status. However, when we considered only diabetic individuals, black race became associated with general (BMI) (p = 0.007) and central obesity (CC) (p > 0.001), only among women.*

Aged; Diabetes Mellitus; Obesity; Race or Ethnic Group Distribution

[1] Universidade Estadual de Campinas, Campinas, Brasil.
[2] Universidade do Porto, Porto, Portugal.

Correspondence
M. C. Moretto
Universidade Estadual de Campinas.
Rua Tessália Vieira de Camargo 126, Cidade Universitária Zeferino Vaz, Campinas, SP
13083-887, Brasil.
mcmoretto@hotmail.com

Introduction

Race and ethnicity are concepts used in health services and the scientific literature to identify socioeconomic disparities and, though they have different definition, the two are often confused [1]. Race is described as a group of individuals who share morphological or phenotypical characteristics [1]. It is represented by self-reported skin color in the main Brazilian censuses, carried out by the Brazilian Institute of Geography and Statistics (IBGE) [2]. Ethnicity goes beyond physical characteristics. It also involves cultural, social, linguistic, religious, territorial and diet variables [1].

Despite its relevance for identifying individuals exposed to health risks, some raise questions regarding the use of race and ethnicity in research, considering the heterogeneity and methodological complexity of these variables and the subsequent absence of a consensus as to what they measure, how data should be collected and what is the most appropriate categorization of study populations [3].

Obesity, defined as harmful excess of body fat, is now considered a global epidemic, with growing prevalences in the population, even among the elderly [4]. According to data from the *National Health and Nutrition Examination Survey* (NHANES) [5], one third of U.S. elderly individuals (65 years or more) are obese, with a body mass index (BMI) equal to or higher than 30kg/m². In Brazil, 57.8% and 19.8% of individuals aged 65 years or more are overweight and obese, respectively, according to recent data from the Brazilian Ministry of Health [6]. Silva et al. [7] found obesity prevalences of 13.7% (60 to 69 years), 11.5% (70 to 79 years) and 8.3% (80 years or more) in a representative sample of elderly Brazilians.

Obesity plays a crucial etiological role in a series of chronic conditions, chief among them diabetes mellitus [4,8,9], which was responsible for 5.1 million deaths worldwide in 2013 [10]. Particularly among the elderly, obesity, especially abdominal obesity, and diabetes have similar characteristics, which include chronic inflammation (characterized by higher inflammation markers) and insulin resistance [11], and which lead to common comorbidities, such as metabolic syndrome, cardiovascular and renal diseases, bone fragility, dementia and sleep disorders. These conditions lead to unfavorable health outcomes, such as disabilities and reduction in quality of life [8].

Socioeconomic disparities in obesity, as with other health conditions, are well-established in the literature [12,13,14,15,16]. Race and ethnicity, demographic characteristics which are also widely correlated with socioeconomic status [17,18,19,20], are associated with obesity, evaluated by anthropometric indicators of general (BMI) [7,9,21,22,23] and central fat (waist circumference – WC and waist-hip ratio – WHR) [9,24,25].

The relationship between general and central fat with race and ethnicity is not yet clear [7,9,24,25]. Some studies show associations with high BMI and WC values in white men [21,24,25] while in other studies, obesity is associated with women or individuals of both genders and black [9,15,22,23] and Hispanic [22,23] race/ethnicity, in comparison with white individuals. Meanwhile, national and international findings have shown associations between diabetes and minority races/ethnicities [26,27,28,29], which is explained by a set of social, economic, biological and environmental factors [29].

Given the scarcity of descriptive data, especially in Brazil, regarding the association between race and obesity among the elderly, including the presence of chronic diseases, among which diabetes, this study sought to: investigate the effect of race on measures of general (BMI) and central fat (WHR and WC) according to gender in a sample of elderly individuals living in urban areas in seven places in Brazil, adjusting for schooling and family income variables; and subsequently evaluate the variation of this effect on the presence of self-reported diabetes.

Materials and methods

Participants

The study sample comprised 2,566 elderly community dwellers aged 65 years or more who lived in the following places in Brazil: Campinas (São Paulo State), Belém (Pará State), Parnaíba (Piauí State), Campina Grande (Paraíba State), Poços de Caldas (Minas Gerais State), Ivoti (Rio Grande do Sul State) and Ermelino Matarazzo district (São Paulo State). This is a cross-sectional study that used secondary data from the multi-center, multidisciplinary population study FIBRA (*Frailty in Elderly Brazilians*) – Unicamp group. The FIBRA Study sought to evaluate frailty of urban elderly community dwellers (65 years of more) according to socioeconomic, psychological and biological aspects.

The FIBRA sample was selected through a simple random sample of the census sectors of the urban zone of the seven places where data was collected. For each of these places, there were pre-established quotas of the census sectors (90 in Campinas, 93 in Belém, 75 in Poços de Caldas, 62 in Ermelino Matarazzo, 60 in Campina Grande, 60 in Parnaíba and 27 in Ivoti) to be visited by recruiters. The samples should include quotas for men and women and for the age groups 65-69 years, 70-74 years, 75-79 years and 80 years or more, proportionally to the distribution of these segments in the elderly population residing in each urban area. In all places, for each census sector, researchers planned the recruitment of an oversample of 25% of intended elderly participants, respecting the gender and age criteria, to compensate possible losses due to participants not showing up or dropping out at the time of the data collection.

In order to calculate sample size for each city, researchers estimated the sample size needed to get a population proportion of 50% of a given characteristic being studied – the value for which the sample size is the greatest possible (p = 0.50; q = 0.50). The number of census sectors selected through a draw equaled the ratio between the intended number of elderly individuals and the number of urban census sectors present in each city. Researchers established a sample plan that estimated a minimum size of 601 elderly individuals (for a 4% sampling error) for places with more than one million inhabitants (Campinas and Belém) and 384 elderly individuals (for a 5% sampling error) for the other places, with less than one million inhabitants. Ivoti, which had a universe of elderly individuals of 646, was the exception, with a sample estimated at 235 elderly individuals (for a 5% sampling error).

All participants understood instructions, were permanent residents of the household and census sector, and agreed to participate in the research, signing an Informed Consent form. Exclusion criteria were the same used in the *Cardiovascular Health Study* [30]. Data collection took place in the communities, in sites to which participants traveled by their own means. More details on sampling and participant recruitment processes for the FIBRA study can be found in a previously-published article [31].

The State University of Campinas Ethical Review Board approved this study, under the protocol n. 208/2007, according to the demands and procedures established in the National Health Council's *Resolution n. 466/12*, which regulates research involving humans [32].

Instruments and measures

Demographic and socioeconomic data regarding gender, age, race, schooling and family income were obtained through self-reports (date of birth, male vs female gender, years of schooling and family income in gross values). Age, schooling and income variables were grouped in the following categories, respectively: 65-69, 70-74, 75-79, ≥ 80 years; never attended school, 1-4 years, ≥ 5 years; 0.0-1.0, 1.1-3.0, 3.1-5.0, ≥ 5.1 minimum wage. Race is based on the criteria established by the IBGE [2] and was self-reported by participants. In this study, we only included white, brown and black races because other races (indigenous and yellow) were a minority in the sample.

Anthropometric data were collected by trained examiners according to World Health Organization (WHO) recommendations [33]. Participants were weighed using a digital scale (manufactured by G-Tech. Accumed-Glicomed, Rio de Janeiro, Brazil) and height was measured through a scale (200cm) graduated in centimeters and millimeters. BMI was calculated using the equation: BMI = weight (kg) ÷ height² (m) and classified according to criteria established by the Pan American Health Organization (PAHO) for the elderly [34] (underweight < 23; normal weight ≥ 23 and < 28; overweight ≥ 28 and < 30; obesity ≥ 30). WC and hip circumference (HC) were measured with an inelastic millimetered tape (150cm long). With these measures, we calculated WHR (WC ÷ HC), classified according to metabolic risk, according to Bray & Gray's [35] recommendations (risk for men and women, respectively: < 0.91 and < 0.76 low; 0.91-0.98 and 0.76-0.83: moderate; > 0.98 and > 0.83: high/very high). WC was classified according to values suggested by the WHO (risk for men and women, respectively: ≥ 94 and ≥ 80: increased; ≥ 102 and ≥ 88: substantially increased) [26].

Researchers carried out the *Mini-Mental State Examination* (MMSE) before collecting data referring to physical health, including self-reported diabetes. Elderly individuals with a lower score than the cut-off score for their level of schooling were excluded from the study (cut-off scores established by Brucki et al. [36], minus one standard deviation: 17 for illiterate individuals; 22 for 1 to 4 years; 24 for 5 to 8 years; 26 for 9 or more years of schooling).

Diabetes was evaluated through the following dichotomous self-report question: "*has a doctor ever told you that you have the following diseases?*", with diabetes listed as one of the chronic diseases that were part of this item.

Some variables had missing data because participants failed to answer questions or it was impossible to carry out the anthropometric measurements. There was a 13.9% information loss for family income; 0.15% for schooling; 0.97% for race; 0.89% for BMI; 2.02% for WC; and 2.06% for WHR.

Statistical analysis

We analyzed the data using the IBM SPSS, version 20 (IBM Corp., Armonk, USA). In order to describe the sample profile, we carried out frequency analyses (absolute frequencies and percentages) with the categorical data and calculated averages and standard deviations for the continuous numerical variables. We carried out a chi-squared test in order to compare race with socioeconomic status, self-reported diabetes and body fat measures.

Since the study sample did not have all the assumptions required for an analysis of covariance (ANCOVA) (normality of dependent variables, homogeneity of variance and homogeneity of slopes), we carried out Quade's nonparametric ANCOVA (following the procedures described by Marôco [37]) in order to verify the effect of race on anthropometric measures of body fat (BMI, WC and WHR as dependent variables), adjusting for schooling and family income (covariables). We carried out these analyses for the entire sample and, later, for the sample of elderly diabetics (all stratified according to gender). For the multiple comparisons of estimated averages (± standard error) among race groups, we used Bonferroni's test. In all analyses, we used a probability of error type I (α) of 5%, that is, $p < 0.05$.

Results

The sample predominantly comprised women (65.51%), white and brown participants and individuals aged between 65 and 74 years (average age = 72.38 ± 5.58). A significant percentage of individuals reported never having attended school (19.5%) and half of the sample reported having 1 to 4 years of formal education, and family income between 1.1 and 3.0 times the minimum wage (Table 1). The frequency of self-reported diabetes was 19.4% among men and 21.7% among women.

When we classified participants according to race (Table 2), there was a greater proportion of illiterate individuals among black and brown participants ($X^2(4) = 23.78$; $p < 0.001$), and wealthier white individuals ($X^2(6) = 34.29$; $p < 0.001$). White women had higher schooling ($X^2(4) = 54.35$; $p < 0.001$) and were wealthier ($X^2(6) = 59.32$; $p < 0.001$) than women of other races.

There was an association with higher abdominal fat among white men (in comparison with black and brown men), represented by WC ($X^2(4) = 16.62$; $p = 0.002$) and by WHR ($X^2(4) = 15.82$; $p = 0.003$). Adjusting for schooling and family income, we found the same effect of white race on higher WC and WHR, in comparison with brown ($p = 0.001$) and black and brown individuals ($p < 0.001$) respectively (Table 3), only among men. However, among women, we found no variation of any anthropometric measure according to race.

For men, diabetes frequency did not vary according to race, while among women, diabetes was more frequent among brown and black women, when compared with white women ($X^2(2) = 15.40$; $p < 0.001$) (Table 2).

Among diabetics, the effect of race on body fat measures was not present, but it was evident on women's BMI and WC, adjusting for socioeconomic conditions (Table 4). Black diabetic women had the highest BMI (30.30kg/m^2) and WC (98.67cm), in comparison with brown women ($p = 0.007$ and $p < 0.001$). These values indicate general and, especially, abdominal obesity. Brown diabetic women had the lowest abdominal fat, when compared with the other race groups.

Discussion

This study sought to describe and compare anthropometric measures of body fat according to race among elderly Brazilians, as well as to evaluate the effect of race on these indicators for individuals who self-reported diabetes.

In this sample, there was a high percentage of white men and women, followed by brown men and women. Although race, indicated by self-reported skin color, represents the individual's phenotypic characteristic, is also the result of a sociocultural construction that is dependent on the individual's context [17].

According to Penner & Sapperstein [38], individuals' perception of self-reported race is fluid and changes over time because it relates, in part, to individuals' social status. The researchers observed that, in a sample of North Americans, those unemployed, incarcerated or poor were more likely to identify as black than as white. A Brazilian study showed that men aged 40 years or older tended to self identify as brown (as opposed to white) when interacting with black interviewers (in comparison with white interviewers). Furthermore, black interviewers (in comparison with white interviewers) were less likely to evaluate black men (aged 40 years or older) as black (as opposed to white). These data suggest that an interaction between age, gender and race of research participants and interviewers may mediate the results obtained in processes for racial classification [39].

However, Fuchs et al. [40] considered self-reported race as a reliable and useful measure, especially in epidemiological studies, in addition to being the main measure for evaluating race in Brazilian censuses.

In this study, white race was associated with a high degree of abdominal fat (WC and WHR), when compared with brown and black race, only

Table 1

General sample characteristics. FIBRA Study (Unicamp group), São Paulo State, Brazil, 2008-2009.

Variables	Men	n	Women	n
Age (average ± SD)	72.76 ± 5.72	885	72.17 ± 5.50	1,681
Age groups [years] (%)				
65-69	34.8	308	38.9	654
70-74	33.4	296	30.0	505
75-79	17.4	154	20.0	336
≥ 80	14.4	127	11.0	186
Race (%)				
White	52.9	466	58.0	963
Black	10.0	88	7.3	121
Brown	37.1	327	34.7	576
Years of schooling (average ± SD)	4.62 ± 4.27	884	4.28 ± 3.86	1,678
Schooling categories (%)				
Never attended school	19.3	171	19.6	329
1-4 years	46.5	411	50.4	846
≥ 5 years	34.2	302	30.0	503
Family income in MW (average ± SD)	4.78 ± 6.36	796	3.55 ± 3.93	1,413
Family income categories [MW] (%)				
0.0-1.0	8.3	66	12.2	173
1.1-3.0	45.0	358	50.5	714
3.1-5.0	23.0	183	21.2	300
≥ 5.0	23.7	189	16.0	226
Presence of diabetes (%)	19.4	172	21.7	364
BMI (average ± SD)	26.33 ± 4.27	877	27.72 ± 5.06	2
WC (average ± SD)	94.66 ± 11.16	862	90.22 ± 11.62	1,652
WHR (average ± SD)	0.96 ± 0.06	861	0.88 ± 0.07	1,652

BMI: body mass index; MW: minimum wage; SD: standard deviation; WC: waist circumference; WHR: waist-hip ratio.

among men. Similar data were found in other Brazilian studies. Ferreira et al. [24], in a sample of 1,235 also did not find an association between race and IMC, even though study participants were younger (20 to 59 years) than those in our study. However, they found higher values for WC ($p < 0.01$) and WHR ($p = 0.05$) among white men over 30 years of age (in comparison with black men), when adjusting for age, body fat percentage, alcohol consumption, smoking, physical activity, income and schooling.

In a study on individuals aged between 20 and 69 years, Castanheira et al. [25] also found a higher WC among white men than among brown and black men ($p < 0.001$), but did not find this association among women. According data from the *Brazilian Household Budget Surve*y (POF, in Portuguese), a BMI of ≥ 25kg/m² was associated with white race, in comparison with brown race, among elderly individuals over 60 years of age [7].

However, the international literature shows different results than those found in this study. Most show an association between black and Hispanic race and general obesity (BMI) in samples of adult and elderly individuals [9,21,22,24]. Data from NHANES show an association between general (BMI) and abdominal obesity (WC) with black race, in comparison with white and Hispanic races, in U.S. elderly women (> 60 years).

The discrepancy may result, first, from different classifications used to define race/ethnicity. This limits this type of investigation and makes data comparison and discussion difficult. Additionally, one must consider differences regarding socioeconomic profile and its implications on lifestyle and eating habits among different races/ethnicities in Brazil and in developed countries.

The literature establishes a strong relationship between a lower socioeconomic status and black or brown race [17] and with worse health

Table 2

Association between race and variables related to socioeconomic status, self-reported diabetes and body fat, according to gender. FIBRA Study (Unicamp group), São Paulo State, Brazil, 2008-2009.

Variables	Men [n (%)]			p-value	Women [n (%)]			p-value
	White	Black	Brown		White	Black	Brown	
Schooling				< 0.001				< 0.001
Never attended school	63 (13.5)	21 (23.9)	87 (26.7)		131 (13.6)	32 (26.7)	162 (28.2)	
1-4 years	228 (48.9)	43 (48.9)	137 (42.0)		522 (54.3)	60 (50.0)	249 (43.3)	
≥ 5 years	175 (37.6)	24 (27.3)	102 (31.3)		309 (32.1)	28 (23.3)	164 (28.5)	
Family income (MW)				< 0.001				< 0.001
0.0-1.0	31 (7.2)	4 (5.1)	31 (10.9)		69 (8.5)	14 (13.9)	89 (18.6)	
1.1-3.0	162 (37.7)	44 (56.4)	152 (53.5)		388 (47.6)	55 (54.5)	258 (53.9)	
3.1-5.0	108 (25.1)	17 (21.8)	56 (19.7)		188 (23.1)	20 (19.8)	90 (18.8)	
≥ 5.0	129 (30.0)	13 (16.7)	45 (15.8)		170 (20.9)	12 (11.9)	42 (8.8)	
Diabetes				0.229				< 0.001
Yes	87 (18.7)	23 (26.1)	60 (18.3)		177 (18.4)	36 (29.8)	146 (25.3)	
No	379 (81.3)	65 (73.9)	267 (81.7)		786 (81.6)	85 (70.2)	430 (74.7)	
BMI				0.934				0.531
Underweight	87 (18.8)	16 (18.8)	68 (20.9)		142 (14.8)	18 (14.9)	101 (17.8)	
Normal weight	228 (49.2)	42 (49.4)	161 (49.5)		391 (40.9)	45 (37.2)	219 (38.6)	
Overweight	71 (15.3)	14 (16.5)	41 (12.6)		151 (15.8)	19 (15.7)	75 (13.2)	
Obesity	77 (16.6)	13 (15.3)	55 (16.9)		273 (28.5)	39 (32.2)	172 (30.3)	
WC				0.002				0.718
No risk	186 (40.8)	45 (53.6)	168 (52.8)		150 (15.8)	19 (15.8)	97 (17.4)	
Increased	141 (30.9)	26 (31.0)	89 (28.0)		219 (23.0)	27 (22.5)	140 (25.0)	
Substantially increased	129 (28.3)	13 (15.5)	61 (19.2)		583 (61.2)	74 (61.7)	322 (57.6)	
WHP				0.003				0.742
Low	81 (17.8)	21 (25.0)	76 (23.9)		34 (3.6)	2 (1.7)	16 (2.9)	
Moderate	209 (45.9)	39 (46.4)	167 (52.5)		202 (21.2)	23 (19.2)	120 (21.5)	
High/Very high	165 (36.2)	24 (28.6)	75 (23.6)		716 (75.2)	95 (79.2)	423 (75.7)	

BMI: body mass index; MW: minimum wage; WC: waist circumference; WHR: waist-hip ratio.

Table 3

Effect of race on body fat according to gender, adjusted by schooling and family income.

	Men (average ± SE)			Women (average ± SE)		
	White	Black	Brown	White	Black	Brown
BMI	26.36 ± 0.21	26.42 ± 0.48	26.69 ± 0.25	27.74 ± 0.18	28.58 ± 0.51	27.59 ± 0.23
WC	96.23 ± 0.52 *	93.05 ± 1.25	93.46 ± 0.65 *	90.64 ± 0.41	91.51 ± 1.16	88.95 ± 0.54
WHR	0.97 ± 0.003 **	0.95 ± 0.008 **	0.95 ± 0.008 **	0.88 ± 0.003	0.89 ± 0.007	0.88 ± 0.003

BMI: body mass index; SE: standard error; WC: waist circumference; WHR: waist-hip ratio.

Note: results from Quade's nonparametric ANCOVA, represented by average ± SE. Bonferroni multiple comparison test.

* Statistically significant (white ≠ brown): $F(2.766) = 6.562$; $p = 0.001$;

** Statistically significant (white ≠ brown and black): $F(2.765) = 9.493$; $p < 0.001$.

Table 4

Effect of race on body fat among diabetic elderly individuals according to gender, adjusted by schooling and family income.

	Diabetic men (average ± SE)			Diabetic women (average ± SE)		
	White	Black	Brown	White	Black	Brown
BMI	27,30 ± 0,54	26,74 ± 1,01	28,54 ± 0,64	28,99 ± 0,39	30,30 ± 0,85 *	27,91 ± 0,44 *
WC	99,23 ± 1,26	93,14 ± 2,37	97,36 ± 1,51	95,50 ± 0,92 **	98,67 ± 2,00 **	90,75 ± 1,03 **
WHR	0,99 ± 0,008	0,95 ± 0,015	0,96 ± 0,010	0,91 ± 0,006	0,92 ± 0,013	0,90 ± 0,007

BMI: body mass index; SE: standard error; WC: waist circumference; WHR: waist-hip ratio.

Results from Quade's nonparametric ANCOVA, represented by average ± SE. Bonferroni multiple comparison test.

* Statistically significant (black ≠ brown): $F(2.295) = 4.976$; $p = 0.007$;

** Statistically significant (brown ≠ white and black): $F(2.293) = 10.302$; $p < 0.001$.

conditions [13], including obesity [12,15]. However, though black and brown elderly individuals in this study had unfavorable schooling and income levels, it was white men who showed the worst metabolic condition, indicated by higher WC values. Monteiro et al. [41] found that higher income, which would lead to greater consumption of food, was a risk factor for obesity, especially among men.

Despite the fact that this study's analyses were adjusted for schooling and income, environmental factors related to health behaviors, such as physical activity levels, eating habits, smoking and alcohol consumption were not addressed, but could influence the findings regarding racial differences.

Additionally, the evaluation of socioeconomic status over an individual's life course would better explain obesity among adults, as the literature shows. Wealth or poverty during childhood could affect nutritional status and fat deposits later in life [42,43]. González et al. [42] verified that, regardless of family income at the time of the study, men born into families with higher purchasing power had higher WC in adulthood. Thus, this study's findings must be interpreted with caution, since controlling for socioeconomic variables does not completely eliminate their effect on race.

Another important aspect is individuals' caloric output throughout life, particularly that which results from labor and displacement. Evidence shows that men with lower schooling [44] and income [44,45] were more active in their work and displacements. These individuals are more likely to do informal work (which require greater physical effort), tend to live farther away from work, are more likely to use public transportation and spend more time with desplacement [44]. Given that, in our study, black and brown men had lower schooling and income than white men, we may suppose that the higher abdominal fat among white men could be related to better life and work conditions, which would lead to a more sedentary lifestyle and lower energy consumption.

However, in our study, when considering only participants who had self-reported diabetes, we found higher BMI and WC values among black women, when compared with brown women, regardless of economic condition (income) and schooling.

The relationship between abdominal fat and diabetes is well-established in the literature, which shows that obesity (general and central) is a risk factor for diabetes, since it favors a state of chronic inflammation and insulin resistance, contributing to an increased prevalence of the disease, especially among the elderly [4,9,11].

The literature has shown an association between a higher prevalence and incidence of diabetes with minority races or ethnic groups, such as black and Hispanic [23,27,28]. In a study on 941 elderly men and women, Noble et al. [27] observed a higher diabetes prevalence among non-white individuals. The prevalence was 19.6% and 20.1% among Hispanic and black individuals, respectively, versus 8.2% among white individuals ($p < 0.001$).

Likewise, Whitson et al. [28], in an analysis adjusted for gender and socioeconomic status, showed that elderly black individuals were more obese, had more disabilities and a higher diabetes prevalence, when compared with white individuals.

Racial differences associated with higher morbity [19,46,47], obesity [9,15,22,29] and disability [16,28] are largely explained by unfavorable socioeconomic conditions, with lead to an accumulation of unhealthy behaviors and lifestyle, due to lower access to information, quality education and health services. According to Chor [20], race, socioeconomic status and gender are crucial variables that must be analyzed together, given their interrelations, which influence disparities and create vulnerabilities to health risks.

The higher obesity among diabetic black elderly women found in our study may have been influenced by unfavorable conditions faced by this group over their lives [15,47], even in cases in which they reached higher levels of schooling [17], due to reduced opportunities for upward social mobility, in addition to differences and worse care in health services, a reflex of racial discrimination and social exclusion [20,47]. Cunningham et al. [48] showed that, over an eight year period, there was a significant increase in WC and BMI among black women who reported greater racial discrimination (the same was not found for black and white men or for white women).

Authors further emphasize that racial differences in obesity [15] and diabetes [29] result from a complex interaction that encompasses, beyond socioeconomic and environmental factors (lifestyle), biological/physiological conditions that include: lower resting and total energy output among black individuals (especially women) than in white individuals [29]; lower levels of adiponectins (associated with higher body fat and metabolic syndrome) in black individuals (versus white individuals) [15]; in addition to a possible predisposition of ethnic minorities to insulin resistance [29,49,50]. However, further studies are necessary in order to clarify these associations.

It is worth noting that brown elderly diabetic women had lower WC values, particularly when compared with white women (who were also diabetic), which may be partly explained by lower income and schooling among brown women, which would lead them to have a higher energy output, due to greater use of public transportation or greater workload of domestic work than wealthier women [45]. However, this argument is not valid when comparing black and brown women, since both groups have unfavorable socioeconomic conditions. This study has several limitations. First, the cross-sectional design does not enable us to establish a causality relationship between the variables. Another limitation is the use of self-reports to evaluate diabetes mellitus, which may lead to an underestimation of the disease's prevalence, since some elderly individuals may be unaware of their diagnosis. In spite of this, in an investigation carried out on 10,321 individuals (average age = 63 years), use of self-reported diabetes had high validity and specificity in the identification of its prevalence and incidence, when compared with standard recommendations, based on fasting plasma glucose levels, glycosylated hemoglobin (HbA1c) and medication use [51]. The method used to classify race may also be considered a limitation, given the subjective and dynamic nature of this criterion based on self-reported skin color. However, we emphasize this study's relevance, which established a profile of relationship between these variables in a sample of elderly Brazilians, data that is still lacking in the literature.

Conclusion

In a sample of elderly Brazilians, we identified the effect of white race on higher WC and WHR values only for men, regardless of the presence of self-reported diabetes. However, when considering only diabetic individuals, black race became associated with general (BMI) and central obesity (WC), when compared with brown race, only among women. The effect of race on body fat measures was present even when adjusting for socioeconomic variables (schooling and family income).

These data show the importance of public policies that include individualized strategies that are directed at the specificities of each racial group. Public policies must seek to promote health, considering the prevention of obesity as the main risk factor for diabetes, as well as the adequate management of these conditions, with a focus on individuals' function and quality of life.

Contributors

M. C. Moretto and M. E. Guariento contributed to project design, data analysis and interpretation; to writing the article or critically reviewing intellectual content; and was responsible for all aspects of the work in guaranteeing the accuracy and integrity of any part of the work. A. M. Fontaine and A. L. Neri contributed to writing the article or critically reviewing intellectual content; and to the article's final approval. C. A. M. S. Garcia contributed to writing the article or critically reviewing intellectual content.

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Resumo

*O objetivo deste trabalho foi investigar o efeito da cor/raça em medidas indicadoras de adiposidade corporal (índice de massa corporal – IMC, circunferência de cintura – CC e relação cintura-quadril – RCQ), bem como sua relação com o diabetes, em idosos residentes na área urbana de sete localidades brasileiras, conforme o gênero. O estudo transversal foi realizado com uma amostra probabilística composta por 2.566 idosos de 65 anos ou mais, participantes do Estudo FIBRA (*Fragilidade em Idosos Brasileiros*). Foram utilizadas variáveis sociodemográficas autorrelatadas (gênero, idade, cor/raça, escolaridade e renda familiar), medidas antropométricas indicadoras de obesidade geral (IMC) e abdominal (CC e RCQ) e diabetes autorreferida. Ajustando-se para escolaridade e renda, a cor/raça branca associou-se a maiores valores de CC (p = 0,001) e RCQ (p > 0,001), no gênero masculino, independentemente do diabetes. Entretanto, ao considerar apenas a amostra de diabéticos, a cor/raça preta passou a associar-se à obesidade geral (IMC) (p = 0,007) e central (CC) (p > 0,001), apenas entre as mulheres.*

Idoso; Diabetes Mellitus; Obesidade; Distribuição por Raça ou Etnia

Resumen

*El objetivo de este trabajo fue investigar el efecto del color/raza en las medidas indicadoras de adiposidad corporal (índice de masa corporal – IMC, circunferencia de cintura – CC y relación cintura-cadera – RCC), así como su relación con la diabetes, en ancianos residentes en el área urbana de siete localidades brasileñas, conforme género. El estudio transversal se realizó con una muestra probabilística compuesta por 2.566 ancianos de 65 años o más, participantes del estudio FIBRA (*Fragilidad en Ancianos Brasileños*). Se utilizaron variables sociodemográficas autorrelatadas (género, edad, color/raza, escolaridad y renta familiar), medidas antropométricas indicadoras de obesidad general (IMC), abdominal (CC y RCC) y diabetes autorreferida. Ajustándose a la escolaridad y renda, el color/raza blanca se asoció a mayores valores de CC (p = 0,001) y RCQ (p > 0,001), en el género masculino, independientemente de la diabetes. No obstante, al considerar sólo la muestra de diabéticos, el color/raza negra pasó a asociarse a la obesidad general (IMC) (p = 0,007) y central (CC) (p > 0,001), solamente entre las mujeres.*

Anciano; Diabetes Mellitus; Obesidad; Distribución por Raza o Etnia

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