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Race and stroke mortality in Brazil

ABSTRACT

As stroke mortality rates according to race were not known in Brazil, data on mortality for the year 2010 was collected from the Mortality Information System of the Brazilian Ministry of Health. Cerebrovascular mortality rates adjusted for age (per 100,000) were calculated with a confidence interval of 95% (95%CI) by sex and race/skin color. The differences between races were significant for men with rates of 44.4 (43.5;45.3), 48.2 (47.1;49.3) and 63.3 (60.6;66.6) for white, brown and black, respectively; and for women, with rates of 29.0 (28.3;29.7), 33.7 (32.8;34.6) and 51.0 (48.6;53.4) for white, brown and black, respectively. The burden of stroke mortality is higher among blacks compared to brown and white.

DESCRIPTORS: Stroke, epidemiology. Mortality Rate. Gender and Health. Ethnicity and Health.

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INTRODUCTION

In Brazil, deaths from cerebrovascular disease exceed those from coronary disease in absolute terms. This pattern results from the higher proportion of cerebrovascular disease in inhabitants in the North and Northeast of the country and in women and from the fact that arterial hypertension has a greater impact on cerebrovascular disease than on coronary disease.⁴ Incidence, lethality and mortality rates per ethnic group are higher among blacks than whites in the United States, explained by differences in mean systolic pressure and by socioeconomic determinants.² The only research conducted in Brazil that approaches the relationship between gender, race and cerebrovascular mortality was in the municipality of Sao Paulo, Southeastern Brazil (1999-2001) finding higher mortality among blacks, with those of mixed race in an intermediate position, close to that of whites.³

Mortality rates reflect incidence as well as lethality. Immediate and delayed mortality from cerebrovascular disease differs between whites, mixed race and blacks, for whom there are no data on incidence. The *Estudo de Mortalidade e Morbidade do Acidente Cerebrovascular* in Sao Paulo (EMMA – Stroke Mortality and Morbidity Study),¹ with a cohort of patients having suffered their first cerebrovascular episode, identified that survival rates up to four years after hospitalization were lower among mixed race and blacks after adjusting for sex, age and socioeconomic position.

Recording mortality data by race was established in 1996 in Brazil. The lowest rate of this section being left blank (6.4%) and the lowest proportion of deaths from unknown causes (7.0%) occurred in 2010. At the same time, in the Population Census^a of that year, 99.5% of respondents completed the section on race/skin color. This unprecedented situation meant that mortality rates could be calculated by race/skin color with greater accuracy. Moreover, in contrast to the United States, where there is dichotomous classification between black and white, in Brazil, the percentage of individuals of mixed race is significant, making it important to identify their situation with regards cerebrovascular mortality rates, whether it is closer to that of blacks or whites.

Describing differences in cerebrovascular mortality in Brazil will contribute to establishing public policies to care for strokes and, especially, to new approaches in caring for those with high blood pressure.

METHODS

All deaths of individuals aged between 30 and 69 years that occurred in 2010 were classified using

the International Classification of Diseases – Tenth Revision (ICD-10). The age group studied was chosen as it covered most deaths from strokes, with the lowest rate of cases from unknown causes. Deaths classified as being from all types of cerebrovascular disease (ICD-10: I60-69), from acute episodes (ICD-10: I60-68), permanent injuries (ICD-10: I60-69), parenchymal (ICD-10: I61-62) and ischemic bleeding (ICD-10: I63-64) were calculated. Separating acute cases from those with later complications meant that immediate and delayed lethality could be indirectly identified.^{4,5} Including deaths whose underlying cause was simply reported as arterial hypertension (ICD-10: I10-15) is justified as it avoids errors of different classification between whites, mixed race and blacks. Those classified as Asiatic or Indigenous were not included due to their small number. With regards the close relationship between risk factor (arterial hypertension) and disease (cerebrovascular), not fully completing the death certificate leads to deaths that should be classified as from cerebrovascular disease being classified as from hypertension. All of the data were obtained from the archives of the Ministry of Health Mortality Information System.^b

Population data were taken from the 2010 National Census, collected by the Brazilian Institute of Geography and Statistics (IBGE).^a The rates (per 100 thousand inhabitants) were adjusted for the Brazilian population using the direct method and are presented by sex and race/skin color. The 95% interval of confidence for each rate was calculated using Chiang's method, using the formula "rate \pm 1.96 * (standard error)", with standard error calculated using the ratio of the rate adjusted by the square root of the number of deaths. The difference in rates between races was considered significant when there was no overlap of the intervals of confidence.

Two comparisons were derived from the mortality rates: ration of males/females by type of cerebrovascular disease; and ratio between deaths at the acute stage and those due to later complications from cerebrovascular disease by sex and between whites, mixed race and blacks. The Chi-squared test was calculated for the ratios for race, followed by Marascuilo's post hoc test to identify differences between the three categories studied.

RESULTS

In men, 27,008 deaths from cerebrovascular causes were identified. Table 1 shows that, comparing the rates and the intervals of confidence, the risk of death is always lower among whites, followed by mixed race, and higher among blacks. It is an unchanging pattern covering

^aInstituto Brasileiro de Geografia e Estatística. Censo Populacional 2010. Rio de Janeiro; 2010 [cited 2013 May 1]. Available from: <http://www.ibge.gov.br/home/estatistica/populacao/censo2010>

^bMinistério da Saúde. DATASUS. Estatísticas em Saúde. Rio de Janeiro; 2011 [cited 2013 May 1]. Available from: <http://www.datasus.gov.br>

Table. Mortality rates/100 thousand inhabitants adjusted for age for cardiovascular disease, arterial hypertension and for cerebrovascular diseases by race/skin color and by gender.^a

Variable	White		Mixed race		Black	
	Rate/100 thousand	95%CI	Rate/100 thousand	95%CI	Rate/100 thousand	95%CI
Males						
Cerebrovascular diseases	44.4	43.5;45.3	48.2	47.1;49.3	63.3	60.6;66.6
Acute	35.8	35.0;36.6	41.4	40.4;42.4	53.8	51.3;56.3
Ischemia	18.1	17.5;18.7	23.2	22.4;24.0	29.3	27.5;31.1
Parenchymal hemorrhage	11.0	10.5;11.5	12.3	11.8;12.8	15.8	14.5;17.1
Complications	5.8	5.5;6.1	4.7	4.4;5.0	7.3	6.4;8.2
Hypertension	11.9	11.5;12.3	16.3	15.7;16.9	28.8	27.2;30.4
Ratio later complications/acute ^b	0.16		0.11		0.14	
Females						
Cerebrovascular diseases	29.0	28.3;29.7	33.7	32.8;34.6	51.0	48.6;53.4
Acute	21.9	21.3;22.5	27.5	26.7;28.3	41.1	39.0;43.2
Ischemia	10.5	10.0;11.0	14.9	14.1;15.7	21.6	19.5;23.7
Parenchymal hemorrhage	7.1	6.8;7.4	7.8	7.5;8.1	11.9	11.1;12.7
Complications	2.7	2.5;2.9	2.5	2.3;2.7	4.5	3.8;5.2
Hypertension	17.0	16.4;17.6	22.0	21.2;22.8	34.5	32.6;36.6
Ratio later complications/acute ^c	0.12		0.09		0.11	

^a According to the 10th International Classification of Diseases, all deaths classified as due to arterial hypertension (ICD-10: I10-15), from all cerebrovascular causes (ICD -10: I60-69), from acute episodes (ICD -10: I60-68), from later complications (ICD -10: I69), hemorrhages (CID-10: I61-62) and ischemia (ICD -10: I63-64).

^b $\chi^2 = 60.9$; g.l = 2. Marascuilo's post hoc test: White *versus* Mixed race ($p < 0.001$); White *versus* Black ($p < 0.05$); Mixed race *versus* Black ($p = 0.08$).

^c $\chi^2 = 21.0$; g.l = 2. Marascuilo's post hoc test: White *versus* Mixed race ($p < 0.001$); White *versus* Black ($p < 0.52$); Mixed race *versus* Black ($p = 0.16$).

cerebrovascular deaths and subtypes. A different pattern can be seen in rates of death from later complications, with higher figures among blacks, followed by whites and mixed race. However, when comparing the ratio of deaths from "later complications/acute stage" there is a significant difference between whites and mixed race and whites and blacks, but not between mixed race and blacks. This shows that survival rates after the acute stage may be higher for whites.

Among women, there were 14,379 deaths from cerebrovascular causes, with lower rates among whites, followed by mixed race, then blacks. As observed in men, the values for those of mixed race are closer to those of whites than blacks. In the comparison between deaths from later complications or from acute cases, the proportion remained higher for whites, but only when compared to mixed race women.

The rates were higher among men than women of the same race. For total cerebrovascular disease, the male/female ratio was 1.33 for whites, 1.30 for mixed race men and 1.22 for blacks (with a significant difference only for whites *versus* blacks, $p < 0.05$). In acute cases,

the ratios were different, but without statistical significance. However, for deaths due to later complications, the ratio between whites was 1.89, mixed race 1.24 and blacks 1.18 (difference white *versus* mixed race and white *versus* mixed race, both with $p < 0.001$).

For both sexes, comparison of deaths with "hypertension" as the underlying cause always showed higher levels among blacks, followed by mixed race, then whites, which would exclude classification bias.

DISCUSSION

Cerebrovascular mortality rates in Brazil adjusted for age and for race/skin color show an increased risk of dying from these illnesses in blacks, followed by mixed race and consistently lower among whites. Black women had a higher mortality rate than black men, higher than the gender difference in mixed race and white men.

These results enlarge on the relationship described above between sex, race and cerebrovascular mortality in the municipality of Sao Paulo, between 1999 and 2001.³ However, the differences in the risk of

cerebrovascular mortality remain the same as those described for Sao Paulo, SP, Southeastern Brazil.³ Currently, in Brazil as a whole, in men, risk of death cerebrovascular mortality is 40.0% higher for blacks than for whites, as in Sao Paulo; among women, the risk is also higher for blacks than for whites and was 76.0% for Brazil and 80.0% for Sao Paulo, in 2010.³

Explanations for these observations are: firstly, racial difference in the prevalence of arterial hypertension, the main risk factor for cerebrovascular disease, consistently higher among blacks; secondly, higher incidence of cerebrovascular disease among blacks due both to hypertension and to socioeconomic variables;² and, thirdly, the lethality of acute cerebrovascular events may be a differential between whites, mixed race and blacks. Judd et al² showed that the proportion of deaths from later complications is higher among whites, indicating better survival rates for cerebrovascular events among whites compared with mixed race and blacks. These data corroborate the results of the EMMA¹ in Sao Paulo, where survival rates four years after the first stroke were 17.0% lower among mixed race and 46.0% lower among blacks compared with whites

after adjusting for age, schooling and risk factors. The EMMA showed higher survival rates occurred in cases of parenchymal bleeding, more strongly related to arterial hypertension than strokes.¹

Due to the fall in cerebrovascular mortality in all regions of Brazil,⁵ another important hypothesis to be tested is whether annual decline in rates is the same by sex and race/ethnicity. Moreover, the difference between sexes in each race needs to be better explained.

Studies on mortality have limitations inherent to the sources of the data, especially the accuracy of the data that provides the underlying cause of death, as indicated in the case of high blood pressure. Identifying race/skin color can be done by the deceased or a relative upon hospitalization, or reported by third parties when filling in the death certificate, reflecting criteria that are far from homogenous.

To conclude, mortality from cardiovascular disease in Brazil shows clear difference between whites, mixed race and blacks, with a higher rate among blacks of both genders, followed by mixed race.

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