Determinants of Stroke in Brazil: A Cross-Sectional Multivariate Approach from the National Health Survey

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Objective: The objective of this study was to investigate the association between biological-health, socioeconomics, and behavioral determinants and stroke by evaluating the risk of stroke in the presence of each or all determinants grouped in a multivariate model. *Methods:* This study is a transversal secondary data analysis of the Brazilian National Health Survey, released by the Brazilian Institute of Geography and Statistics. The prevalence, prevalence ratios, and confidence intervals were calculated for the main outcome. A multivariate regression model was applied, with the stroke as outcome and all other variables with a *P* value of .20 or lower in the univariate analysis included as explanatory variables to adjust for potential confounders and effect modifiers. *Results:* The mean age was 43.3 ± 16.6 years, ranging from 18 to 101 years. The prevalence of hypertension was 21.4%, and with regard to lifestyle habits, it was observed that 20.0% had smoked but stopped and 29.7% practiced physical activity in the last 30 days. The regression model showed that the odds ratio in the final model was weighted, with low schooling, smoking habit, overweight, low physical activity practice, diabetes, and hypertension being significantly associated with stroke. *Conclusion:* The multivariate model showed that the chance of stroke is high, both combined or isolated.
Key Words: Stroke—risk factors—cardiovascular diseases—epidemiology.

Introduction

Cardiovascular diseases and stroke are the major cause of death worldwide and represent a public health challenge in both industrialized and developing countries.[1] Cardiovascular diseases are the most common chronic noncommunicable diseases (NCDs) and, among them, high blood pressure (HBP) is the most clinically relevant medical condition owing to its association with acute events such as cerebrovascular accident.[2]

In one of the most relevant population transversal studies in Brazil, the National Health Survey (NHS), 45.1% of the individuals have been reported presenting with at least 1 NCD and the south region presented the highest prevalence at 52.1%. Considering each NCD, HBP has shown the highest prevalence (21.4%) followed by chronic back problem (18.5%), depression (7.6%), arthritis (6.4%), and diabetes (6.2%).[3]

Stroke, in turn, is the second cause of death worldwide. In the United States, between 2007 and 2010, it was estimated that 6.8 million people over 20 years have had stroke, with a prevalence of around 2.8%.[4] In Brazil, studies on the prevalence and incidence of stroke are scarce; however, a longitudinal study has shown an incidence of 1.7% in a follow-up of 6 years.[5]

Many studies have been developed in Brazil with the objective to determine the prevalence, associated factors, and ways for preventing NCDs. In one of those studies,

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based in NHS, the number of people with stroke was 2231 million, resulting in a prevalence of 1.6% in men and 1.4% in women.[6]

Different biological (e.g., race and age),[7] socioeconomic (e.g., schooling and income),[8] and behavioral determinants (e.g., physical activity practice and alcohol or tobacco consumption)[9] are potentially related factors that increase the risk of developing NCDs, including cerebrovascular events, such as stroke. These determinants may explain the differences in the association strength between HBP and cerebrovascular diseases in different countries.

Thus, the present study aimed to investigate the association between biological-health, socioeconomics, and behavioral determinants and stroke by evaluating the risk of stroke in the presence of each determinant or all determinants grouped in a multivariate model.

Methods

Study Design and Sample

The present study is a secondary data analysis of the Brazilian NHS (2013), which is an initiative of the Ministry of Health, in partnership with the Brazilian Institute of Geography and Statistics. The purpose of NHS was to characterize the health situation and the lifestyles of the Brazilian population, as well as attention to their health, regarding access and use of services, preventive actions, continuity of care, and financing of care.[10]

For sample selection, cluster sampling was used, with census tracts as primary unit, households as secondary units, and an adult (≥18 years old) from each household as a tertiary unit to respond to the individual part of the questionnaire. Initially, 81,167 households were selected. After the collection was completed, interviews were conducted in 64,348 households and 60,202 residents answered the individual questionnaire, which was the focus of the present study.[11]

The NHS information is available for access at the Brazilian Institute of Geography and Statistics website (http://www.ibge.gov.br/home/estatistica/populacao/pns/2013/default_microdados.shtm), where microdata, variable dictionaries, questionnaires, and all the methodological procedures are available.

Studied Variables

The NHS questionnaire is subdivided into 3 parts, the domicile, that of all residents of the household, and the individual. The household questionnaires and those of all the residents of the household were answered by a resident of the household who can provide information about the socioeconomic and health situation of all the residents. The individual questionnaire was answered by a resident who is 18 years of age and older, who is selected with characteristics similar to those of all the adult residents of the household.[10]

The NCDs (diabetes, HBP, and stroke) were investigated in a self-reported manner by the question "Has a doctor ever given you the diagnosis of. . .?" For analysis purposes of the present study, stroke was used as the dependent variable (outcome). HBP was considered as the main independent variable. Seven other variables were included as independent variables: age as a continuous data; gender (man or woman); race and color, operationalized as white and nonwhite (i.e., black, yellow, brown, or indigenous); schooling, operationalized as "literacy and secondary school" and "high school and college complete"; physical activity practice; diabetes (yes or no); and body mass index (normal or overweight).[12]

Statistical Analysis

Categorical variables were presented as absolute and relative frequencies, whereas continuous data were presented through central and dispersion measures, according to the normality of data verified by the Kolmogorov–Smirnov test.

The prevalence, prevalence ratios, and 95% confidence intervals (CIs) were calculated for the main outcome studied (stroke). A multivariate logistic regression model was applied, with the stroke as the investigated outcome and all other variables with a P value of .20 or lower in the univariate analysis (chi-square) included as explanatory variables to adjust for potential confounders and effect modifiers. Statistically significant associations in multivariate analysis (P value of <.05) were expressed by odds ratio (OR) and its respective 95% CI. Analytical procedures were conducted using the STATA statistical software (version 12.0; Stata Corporation, College Station, TX).

All ethical procedures followed the recommended by Helsinki declaration.

Results

The mean age of the 60,202 studied individuals was 43.3 ± 16.6 (mean ± standard deviation) years old, ranging from 18 to 101 years. Regarding the characteristics of the studied population, 56.9% were women, 49.0% were self-declared "black or brown," and 38.7% had completed high school.

The overall stroke prevalence was 1.60%. Table 1 presents the stroke prevalence according to the independent variables studied. Stroke was more prevalent in men who were white, with low schooling, from the south region, who were smoking or with a history of a smoking habit, who did not practice physical activity, who were overweight and affected by diabetes, and who had HBP. Among those affected by stroke, 67.5% (n = 652) had access to tomography.

Because Brazil is a large and economically disparate country, the presence of common risk factors for stroke