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ARTICLE

Investigation of the cardiovascular risk profile in a south Brazilian city: surveys from 2012 to 2016

Investigação do perfil de risco cardiovascular em uma cidade no sul do Brasil: inquéritos de 2012 a 2016

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ABSTRACT

The aim of this study was to investigate the cardiovascular risk profile of the participants recruited from stroke awareness campaigns in Santa Maria RS, Brazil, from 2012 to 2016, using the simplified version of the Framingham Risk Score (FRS). Questionnaires were used to evaluate 1,061 participants from 20 to 74 years old. Data on cardiovascular risk factors were obtained. The prevalence of risk factors and mean FRS for men and women were estimated. The FRS for women was 11.8% (moderate risk) and 24.7% for men (high risk). The vascular age for women was 61.6 years, whereas the vascular age for men was 66 years. Two percent of women had hypertension and diabetes, while both these risk factors were present in 5% of men. Based on the data, the prevalence of stroke risk factors is worrisome, as are the numbers of individuals with moderate and high cardiovascular risk in Santa Maria.

Keywords: risk factors; stroke; cardiovascular diseases.

RESUMO

O objetivo desse estudo foi investigar o perfil de risco cardiovascular dos participantes de campanhas sobre acidente vascular cerebral (AVC) em Santa Maria-RS, dos anos de 2012 a 2016, por meio do Escore de Risco de Framingham (ERF) simplificado. Foram utilizados questionários para avaliação de 1061 indivíduos de 20 a 74 anos. Informações sobre fatores de risco cardiovascular foram obtidas. O ERF médio para as mulheres foi de 11,8% (risco moderado) e para os homens, 24,7% (risco alto). A idade vascular média no sexo feminino foi de 61,6 anos, sendo 66 anos o valor encontrado para o sexo masculino. 2% das mulheres eram hipertensas e tabagistas; nos homens, a concomitância desses fatores de risco foi de 5%. Assim, as prevalências de fatores de risco para AVC e de indivíduos com moderado e alto risco cardiovascular são alarmantes em Santa Maria.

Palavras-chave: fatores de risco; acidente vascular cerebral; doenças cardiovasculares.

Stroke is the third leading cause of disability, and the second most common cause of mortality in the world[1]. Among Latin American countries, Brazil has the highest mortality rates due to stroke[2].

However, epidemiological studies on stroke are still scarce in many Brazilian regions. In the case of the city of Santa Maria, Rio Grande do Sul, it is possible that the prevalence of risk factors is different from that observed in other regions of the country, considering local traditions, such as the high consumption of foods rich in saturated fats and sodium, as well as increased rates of smoking and hypertension in Rio Grande do Sul, compared to other states in the country[3,4].

In this context, one of the benefits of conducting surveys in low and middle-income countries like Brazil is the opportunity of producing data based on large samples through relatively inexpensive methods, which could be representative of a population and therefore useful for management of resources in public health.

Gaziano et al.[5] developed calculations that were able to predict cardiovascular outcomes as effectively as methods that use laboratory tests. D'Agostino et al.[6] used sex-specific simplified risk prediction models based on non-laboratory measures. They also formulated the concept of "vascular age", which is the vascular age of an individual calculated as the age of a person with the same cardiovascular risk, but with all the other risk factors within the limits of normality[6].

Based on these assumptions, this study aimed to investigate the cardiovascular risk profile of men and women who participated in stroke awareness campaigns in Santa

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Maria from the year 2012 to 2016, using a predictive model of risk based on non-laboratory measures derived from the Framingham Study and to compare these results with those from other similar studies, to verify whether local traditions produced any effect on the overall prevalence of cardiovascular risk factors in this particular population. It also aimed to quantify the same risk in the form of "vascular age" and to identify the most prevalent individual and combined cardiovascular risk factors among these individuals.

METHODS

The data collection of the study was carried out through surveys obtained by convenience sampling, during stroke awareness campaigns organized by professionals and academics from the departments of Physical Therapy and Medicine, who were previously trained. These campaigns occurred between the years of 2012 and 2016, during one day in the second semester of each year. Passers-by who voluntarily attended the stroke awareness campaign site were invited to participate in the study. The inclusion criteria were age between 20 and 74 years and absence of stroke or previous cardiovascular diseases reported at the time of the questionnaire. All participants in the research signed an informed consent. This study fulfills the requirements of the Ethics Committee of the Federal University of Santa Maria.

The questionnaire applied for data collection contained: general identification items; questions regarding current treatment for systemic arterial hypertension and diabetes; personal history of cardiovascular diseases; current smoking status. Items referring to anthropometric measures (weight, height and waist circumference), capillary blood glucose values; systolic and diastolic blood pressure were obtained on the day of the study, and an evaluation form was filled in by health professionals and trained students.

For the anthropometric measurements, portable electronic scales and measuring tapes were used. Two blood pressure (BP) measurements were also performed through the indirect auscultatory technique with a calibrated sphygmomanometer. The measurements were spaced five minutes apart, and the last measurement was recorded on the evaluation form. Blood glucose was measured by a hemoglucotest.

Individuals were considered to be in treatment for hypertension if they reported the use of one or more antihypertensive agents. Hypertension was also classified as unknown or absent, based on the answers of the individuals in the study. Values ≥ 140 mmHg for systolic blood pressure, and values ≥ 90 mmHg for diastolic blood pressure were considered high[7].

Regarding diabetes, only those individuals who reported the use of antidiabetic drugs in the previous two weeks were considered diabetic. Diabetes was also classified as unknown or absent based on each individual's response. Postprandial capillary glycemia after two hours > 140 mg/dL was considered elevated for non-diabetic individuals. In the case of diabetics, glycemic levels > 180 mg/dL were classified as poor glycemic control[8].

For the definition of increased waist circumference, the reference values used were ≥ 88 cm for women and ≥ 102 cm for men. We defined a body mass index (BMI) ≥ 25 kg/m^2 as overweight; and a BMI ≥ 30 kg/m as obese[2,9,10,11].

Individuals were considered sedentary when they reported not participating in any kind of physical activity at work, at home or at leisure, or when they reported participating in physical activities for periods shorter than 20 minutes a day and with frequencies less than three times per week[12]. Participants were classified as smokers if they currently smoked one or more cigarettes per day.

For the prediction of cardiovascular risk in 10 years, a simplified Framingham Risk Score (FRS) developed for use in primary care, which takes into account only non-laboratory measures, was applied[13]. These variables included age, BMI, systolic blood pressure, use of antihypertensive drugs, current smoking habit, and diabetes[13]. Cardiovascular risk is expressed as a percentage and estimates the probability of a cardiovascular event starting in the next 10 years.

The concept of "cardiac age/vascular age", created by D'Agostino et al.[6] was also used, aiming to simplify the understanding of the cardiovascular risk, expressed in percentages. It is a distinct measurement used to assess the same risk, but in the form of "cardiac age/vascular age"[6]. According to the authors, the "vascular age" of an individual is calculated as the age of a person with the same estimated cardiovascular risk, but with all others risk factors at normal levels[6].

The Epi Info™, version 7.1 (CDC, Atlanta) was used to create a database. Double data entry and standardized procedures were performed for quality checking. The data were then transferred to the SPSS software version 23 for statistical analysis.

We used the statistical software G*Power to perform post hoc power analyses and determine if our non-significant results were due to a lack of statistical power. This analysis indicated that a sample of 1,003 individuals would be enough to detect small size effects (d = 0.2) with more than 90% power using a t-test between means and with alpha at 0.05, two-tailed. As for chi-square, the same sample size would allow the detection of small effects (d = 0.1) with 83% statistical power. Thus, the non-significant results were unlikely to be due to a small sample size[14].

The FRS was codified into three categories: < 10% = low risk; 10-20% = moderate risk; > 20% = high risk. For further comparisons, data on the FRS and cardiac age/vascular age were divided into three age groups (20-39 years, 40-59 years, and ≥ 60 years). Details about the calculations used for these estimates are available at the Framingham Study electronic address cited in the references of this article[13].

The prevalence of risk factors was estimated for the total sample and stratified by sex. Continuous variables were represented by mean and standard deviation, and categorical variables were represented by proportions. In order to perform analyses between groups, chi-square tests were used for proportions and t-tests were used for means. Values of $p < 0.05$ were considered statistically significant.

RESULTS

In total, 1,061 participants aged 20 to 74 years were included in the analysis of the general characteristics. Due to missing data, only 1,003 of these 1,061 participants were included in the overall cardiovascular risk profile assessment. Table 1 shows the general characteristics of the participants and the prevalence of cardiovascular risk factors divided by sex.

In the subgroup analysis, of the 84 individuals who reported not knowing their state of hypertension, 21 (25%) presented with levels of systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg. Throughout the study, 155 participants (14.6%) reported receiving treatment for diabetes. Among the 126 participants who reported not knowing whether they were diabetic, seven had postprandial glycemic levels after two hours higher than 140 mg/dL. Postprandial glycemia after two hours in the population, on average, was 109.2 mg/dL.

Table 2 shows the 10-year cardiovascular risk profile according to the FRS, based on non-laboratory parameters and expressed in percentages, and the vascular age, expressed in years. There were significant differences between men and women in all of the measures shown in this table.

The Figure represents the prevalence of risk factors according to each risk category. About 58% (N = 306) of the women and 60% (n = 320) of the men presented with either diabetes, or hypertension, or were smokers. Approximately 4% (n = 21) of men and the same percentage of women

Table 1. Baseline characteristics

Variables	Women (n = 527, 49.7%)	Men (n = 534, 50.3%)	Total (n = 1061, 100%)	p-value
Age, mean (SD), years	54.7 (15.3)	57.1 (14.3)	55.9 (14.8)	
20–39, n, (%)	85 (8.0)	61 (5.7)	146 (13.8)	0.008*
40–59, n, (%)	226 (21.3)	217 (20.4)	443 (41.7)	
≥ 60, n, (%)	216 (20.4)	256 (24.1)	472 (44.5)	
BMI, mean (SD), kg/m²	28.2 (5.8)	28.0 (5.1)	28.1 (5.5)	0.681
Overweight, n, (%)	178 (33.8)	226 (42.3)	404 (38.1)	0.104
Obesity, n, (%)	169 (32.1)	146 (27.3)	315 (29.7)	0.297
Waist circumference**, mean (SD), cm	95.0 (0.14)	101.0 (0.13)	98.0 (0.14)	0.001*
SBP, mean (SD) mmHg	126.4 (18.8)	134 (19.2)	130 (19.3)	0.000*
DBP, mean (SD) mmHg	80.4 (11.6)	84 (12.9)	82.1 (12.4)	0.000*
Hypertension[a], n, (%)	222 (42.1)	221(41.4)	443 (41.8)	0.965
Diabetes[b], n, (%)	82 (15.6)	73 (13.8)	155 (14.6)	0.662
Glycemia, mean (SD), mg/dL	107 (46.8)	112 (46.4)	109.2 (45.9)	0.191
Smoking, n, (%)	104 (19.7)	131 (24.5)	235 (22.1)	0.066
Sedentary lifestyle, n, (%)	316 (59.9)	271 (50.7)	587 (55.3)	0.005*

*p-value < 0.05; BMI: body mass index; **Values ≥ 88 cm was used as the reference to classify increased waist circumference in women; values ≥ 102 cm corresponded to increased waist circumference in men; SBP: systolic blood pressure; DBP: diastolic blood pressure; [a]treated hypertension; [b]treated diabetes.

Table 2. General cardiovascular risk profile according to the Framingham Risk Score (FRS) and Vascular Age (VA).

Variable	Women (n = 495, 49,3%)	Men (n = 508, 50,7%)	Total (n = 1003; 100%)	p-value
FRS, mean (SD)	11.8 (0.1)	24.7 (0.2)	18.3 (0.2)	0.000*
Low risk, n, (%)	248 (24.7)	98 (9.8)	346 (34.5)	
Moderate risk, n, (%)	128 (12.8)	111 (11.1)	239 (23.9)	
High risk, n, (%)	119 (11.9)	299 (29.8)	418 (41.7)	
FRS**, by age, mean (SD)				0.001*
20–39 years	3.1 (0.1)	3.9 (0.0)	3.5 (0.1)	
40–59 years	9.7 (0.1)	18.6 (0.1)	14.1 (0.1)	
≥ 60 years	21.4 (0.1)	40.7 (0.2)	31 (0.2)	
VA, mean (SD)	61.6 (20.8)	66 (17.7)	63.8 (19.5)	0.000*
20–39 years	30.3 (13.6)	35.2 (10.4)	32.7 (12.6)	
40–59 years	62.3 (14.9)	63.2 (13.2)	62.7 (14.1)	
≥ 60 years	78 (10.1)	79.4 (7.8)	78.8 (8.9)	

*p-value < 0.005; FRS: Framingham Risk Score (risk of cardiovascular event in 10 years), as a percentage; VA: Vascular age, in years, according to the chronological age.

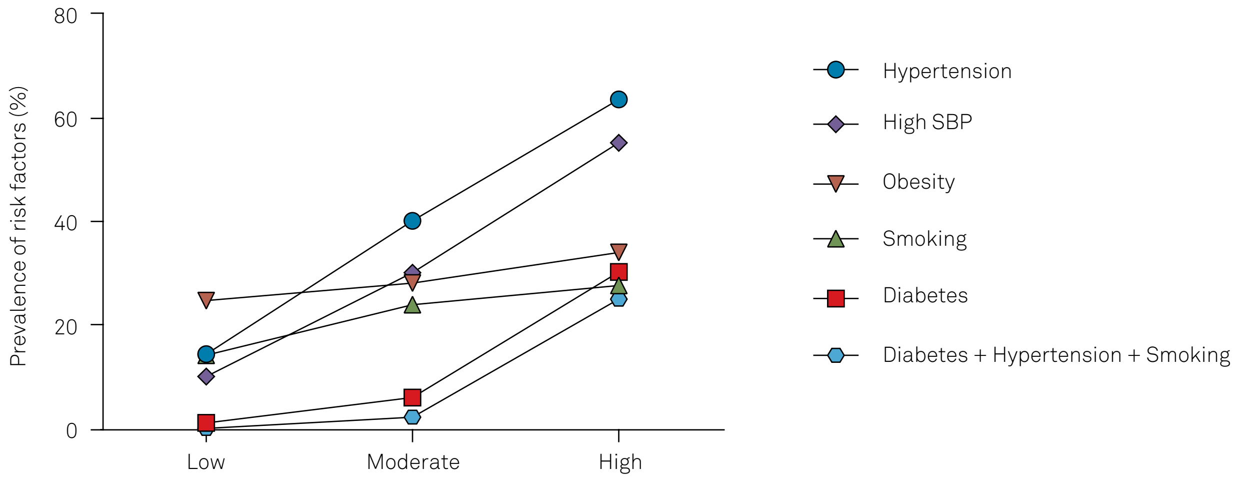

Figure. Prevalence of risk factors according to the Framingham Risk Score categories.

reported current treatment for diabetes and hypertension. In the group of women, 2% (n = 10) presented with hypertension and were smokers, whereas in the men's group, the presence of these two risk factors was 5% (n = 27). On average, 1% of the women (n = 5) and the men (N = 5) were diabetics and smokers; 8% of the women (n = 42) and as well as the men (N = 43) presented with obesity and hypertension; 1% (n = 5) of the individuals from both sexes had diabetes, hypertension and were smokers and 1% (n = 5) of the women had diabetes, hypertension, obesity and were smokers, while the proportion of males (n = 1) with these four risk factors simultaneously was not significant.

DISCUSSION

We hypothesized that local traditions of our population, such as high consumption of saturated fats and sodium would be associated with higher levels of risk factors for cardiovascular diseases when compared with other studies performed in our country. Our hypothesis was not completely confirmed since the epidemiological profile of risk factors found was similar to that of the national studies.

However, most of the population-based surveys performed in Brazil until now used data from state capitals, which are the richest cities in the country and generally have higher levels of income and access to health[15,16,17,18,19,20]. Therefore, it is possible that some risk factors have a lower prevalence in most of the Brazilian cities than has been shown in the majority of the large national studies.

In a cross-sectional population-based study from 2008, carried out in a random sample of 1,968 participants, 20–69 years old, residing in the urban area of Pelotas, Rio Grande do Sul, the prevalence of obesity in the individuals aged 50–59 years was 22.9% in men and 31.4% in women, which was similar to the results of our study for this age group[21].

In a study carried out through telephone interviews of residents of Brazilian capitals (Vigitel), the prevalence of obesity in men from 55–64 years was 19.9%, whereas in women from the same age group it was 21.3%[16]. Even though there may have been some limitations in the analysis of these data, as the prevalence of being overweight was based on self-reported information of height and weight given over the telephone, the prevalence of obesity, particularly in women, was higher in the state of Rio Grande do Sul compared to the national average[16].

As stated by a national population-based home survey from 2008, conducted in households from urban and rural areas throughout Brazil, the national prevalence of being overweight in men of 50 years or older was of 38.2%, and 32% for women of the same age. In the southern region, the prevalence of being overweight was 42.2% among men and 32.7% among women, which was similar to our study[18].

As for diabetes, a telephone-based cross-sectional study conducted in 27 Brazilian state capitals in 2006 (Vigitel) found a self-reported diabetes rate of 12.5% in men from 55-64 years of age and 18.2% in women of the same age[19]. According to an international study that analyzed data from health examination surveys and epidemiological studies corresponding to 370 country-years and 2.7 million participants in 2008, the prevalence of age-standardized diabetes was 9.8% in men and 9.2% in women. In our study, the prevalence of diabetes was similar to that of the regions with the highest levels of this disease in the world, such as Oceania (the prevalence of diabetes was 15.5% for men and 15.9% for women), USA and Spain.[22]

Regarding smoking, the National Health Survey in 2013, using data collected from 64,348 households, found a prevalence of 19% of smokers among individuals from 40–59 years[23], which was similar to the results obtained from the national telephone-based survey from 2008[15], where the rate of smoking between individuals from 45–54 years was 19.7%. However, the prevalence of smoking was higher in men

(21.9%) than in women (17.8%)[15], a trend that was also seen in the present study, where 24.5% and 19.7% represented the rates of smoking among men and women, respectively.

As reported by a national telephone survey from 2009, the prevalence of hypertension in men from 45-54 years was 30.5%, while in women of the same age, it was 37.9%[24]. In our study though, the prevalence of hypertension was 41.8%, which was closer to the rate of 41.73% in individuals from 50-59 years found in a national survey conducted between 2002 and 2003 by the Ministry of Health, in which 9,211 residents from 16 Brazilian state capitals were included[20]. However, this might be explained by the older ages of the participants in our survey.

In the case of sedentary lifestyles, this study[20] also found similar rates of inactivity to the present study, where a 41.73% of the individuals aged 50–59 years had a sedentary lifestyle. In a prospective cohort study from 2004 to 2005, which analyzed 4,297 people born in 1982 in the city of Pelotas, Rio Grande do Sul, women had a higher prevalence of sedentary lifestyle when compared to men (80.6% versus 49.2%)[25]. In our study, women were also significantly less active than men, but this difference was much less pronounced when compared with the cohort from Pelotas.

On average, the cardiovascular risk for women within 10 years was classified as moderate (11.8%), and for men as high (24.7%). Among the individuals with low cardiovascular risk, the majority were women (24.7%), while 9.8% were men. In the high-risk classification, 29.8% were men and 11.9% were women. Cardiovascular risk and risk differences between the sexes increased progressively with age, as confirmed by the mean cardiovascular risk in men over 40 years being almost twice the value for women in the same age range.

The mean vascular age of the women was 61.6 years (6.9 years older than their chronological age), and in the men it was 66 years (8.9 years older than their chronological age). In a cross-sectional study that used the FRS based on laboratory data[26] to assess the cardiovascular risk profile of US residents of Latin American origin, 50.8% of all women and 25.9% of men had a low cardiovascular risk. For moderate risk, 33.7% of women and 28% of men were included in this category. Meanwhile, 46% of men and 15.6% of women had a high cardiovascular risk. The mean cardiovascular risk among women was 11.31% and among men, 18.74%. This tendency of a higher FRS in men than in women, despite the distribution of the cardiovascular risk factors used in the calculation, was also verified in other studies[27,28,29].

Concerning the limitations of this study, there are those intrinsic to cross-sectional studies, such as the fact that past exposures to risk factors were not evaluated, and possible errors of disease classification. However, according to Pereira et. al.[20], taking into account the presence of a Brazilian health system with broad coverage such as the Unified Health System, it is likely that the information coming from the population is not far from reality[20].

It should also be noted that a version of the risk score was used based on non-laboratory measures, which could have resulted in a lower accuracy in the estimation of cardiovascular risk. However, this resource has been used in many countries with low socioeconomic status, as laboratory tests are difficult to access, and the model allows the replacement of lipid tests by the BMI. Furthermore, since 2008, studies have shown that risk assessment methods based on non-laboratory measures are able to predict cardiovascular outcomes as effectively as methods using laboratory tests[5].

Another limitation of the study was the use of self-reported information to assess the presence or absence of morbidities, and the convenience sampling, which could have selected individuals who were more motivated to seek health services.

As for the positive aspects, to the extent of the authors' knowledge, this is the first Brazilian study about stroke that evaluated the cardiovascular risk profile through the calculation of the vascular age. The results obtained will be used to improve the stroke campaigns in Santa Maria in the coming years.

In conclusion, the prevalence of risk factors for stroke in Santa Maria and the rates of individuals with moderate and high cardiovascular risk are alarming.

Thus, it is essential that proper attention should be given to the control of modifiable risk factors for cerebrovascular diseases at a local and national level.

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