

Self-reported medical diagnosis of heart disease and associated risk factors: National Health Survey

Diagnóstico médico autorreferido de doença cardíaca e fatores de risco associados: Pesquisa Nacional de Saúde

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ABSTRACT: *Objective:* To analyze the risk factors associated with the self-reported medical diagnosis of heart disease in Brazil. *Methods:* This is a cross-sectional study, analyzing information from 60,202 adult participants of the Brazilian National Health Survey in 2013. Heart disease was defined by self-reported medical diagnosis of heart disease. We analyzed associations between the occurrence of disease and sociodemographic characteristics, health conditions and lifestyle. A hierarchical binary logistic regression model was used. *Results:* The prevalence of self-reported diagnosis of heart disease in Brazil was 4.2% (confidence interval of 95% [95%CI] 4.0 – 4.3) and was associated with females (odds ratio [OR] = 1.1; 95%CI 1.1 – 1.1), people 65 years old or older (OR = 4.7; 95%CI 3.3 – 5.6), poor or very poor health conditions (OR = 4.1; 95%CI 3.5 – 4.6) and fair health conditions (OR = 2.4; 95%CI 2.2 – 2.7), hypertensive individuals (OR = 2.4; 95%CI 2.2 – 2.7), those with increased cholesterol (OR = 1.6; 95%CI 1.5 – 1.8), overweight individuals (OR = 1.5; 95%CI 1.4 – 1.8) and obese individuals (OR = 2.0; 95%CI 1.7 – 2.2), sedentary behavior (OR = 1.5; 95%CI 1.02 – 2.1), former smokers (OR = 1.4; 95%CI 1.3 – 1.6) or current smokers (OR = 1.2; 95%CI 1.03 – 1.3) and the consumption of fruits and vegetables 5 or more days each week (OR = 1.5; 95%CI 1.1 – 1.5). *Conclusion:* The importance of knowledge on the prevalence of heart disease and associated risk factors in the present Brazilian epidemiological context must be emphasized because it guides actions to control and prevent cardiovascular diseases, the leading cause of death in Brazil and worldwide.

Keywords: Cardiovascular diseases. Self-report. Risk factors. Health surveys. Chronic disease.

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RESUMO: *Objetivo:* Analisar os fatores de risco associados ao diagnóstico médico autorreferido de doença cardíaca no Brasil. *Métodos:* Trata-se de um estudo transversal que analisa informações da Pesquisa Nacional de Saúde (PNS), realizada em 2013. A amostra consistiu de 60.202 adultos. A doença cardíaca foi definida pelo diagnóstico médico autorreferido de doença do coração. Foram analisadas associações entre a ocorrência de doença e as características sociodemográficas, as condições de saúde e o estilo de vida. Foi empregado o modelo de regressão logística binária hierarquizado. *Resultados:* A prevalência de diagnóstico autorreferido de doença cardíaca no Brasil foi de 4,2% (intervalo de confiança de 95% [IC95%] 4,0 – 4,3) e esteve associada a sexo feminino (*odds ratio* [OR] = 1,1; IC95% 1,1 – 1,1), idade igual ou maior que 65 anos (OR = 4,7; IC95% 3,3 – 5,6), avaliação do estado de saúde ruim/muito ruim (OR = 4,1; IC95% 3,5 – 4,6) e regular (OR = 2,4; IC95% 2,2 – 2,7), indivíduos hipertensos (OR = 2,4; IC95% 2,2 – 2,7), colesterol elevado (OR = 1,6; IC95% 1,5 – 1,8), sobrepeso (OR = 1,5; IC95% 1,4 – 1,8) e obesidade (OR = 2,0; IC95% 1,7 – 2,2), insuficientemente ativo nos quatro domínios (OR = 1,5; IC95% 1,02 – 2,1), ser ex-fumante (OR = 1,4; IC95% 1,3 – 1,6) ou ser fumante (OR = 1,2; IC95% 1,03 – 1,3) e consumir frutas e hortaliças 5 ou mais dias da semana (OR = 1,5; IC95% 1,1 – 1,5). *Conclusão:* A importância do conhecimento da prevalência de doença cardíaca e fatores de riscos associados no atual contexto epidemiológico brasileiro deve ser ressaltada para orientar as ações de prevenção das doenças cardiovasculares, que representam a primeira causa de óbito no Brasil e no mundo.

Palavras-chave: Doenças cardiovasculares. Autorrelato. Fatores de risco. Inquérito epidemiológico. Doença crônica.

INTRODUCTION

Chronic Noncommunicable Diseases (NCDs) are the leading cause of morbidity and mortality worldwide. They lead to premature deaths, loss of quality of life, and they are responsible for negative economic and social impacts on society in general^{1,2}. The projections for 2030 are that this group of diseases represents 73% of all deaths worldwide and is the main reason for years of life lost due to disability and limitations^{3,4}.

In 2016, Cardiovascular Diseases (CVD), particularly heart diseases, had the highest mortality rates and Disability-Adjusted Life Years (DALYs) in both genders in Brazil⁵. Also worth noting are the high costs of hospitalizations and treatment in Brazil's Public Health System (*Sistema Único de Saúde* — SUS), as well as the indirect costs caused by reduced productivity, time off work, and the negative effects on the quality of life of sick individuals and their family members^{6,7}.

Risk factors for heart disease are mainly linked to hypertension, diabetes and lifestyle choices: smoking, alcoholism, physical inactivity, inadequate diet, obesity, and physical and psychological stress. All of these factors can be prevented or controlled with interventions that focus on behavior changes and the adoption of healthier lifestyles, as well as through pharmacological therapy, in some cases^{8,9}.

Knowing and quantifying the effects of risk factors for heart disease, particularly modifiable ones, can help identify emerging health threats and opportunities to prevent them. Thus, epidemiological studies, such as the well-known Framingham Heart Study and the INTERHEART Study, conducted in more than 50 countries, have determined the importance of risk factors

for the development of heart disease, as well as the interaction between them^{10,11}. In Brazil, important studies, such as FRICAS and AFIRMAR, have ratified the magnitude of the risk factors described above and have also found significant associations between CVD and positive family history, family income and educational level^{12,13}. However, this is the first nationwide study to assess factors associated with heart disease, and it may contribute to filling in gaps of knowledge about this group of diseases and their associated factors in the Brazilian population.

In 2013, in order to get to know the health profile of the Brazilian population, the Ministry of Health and the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística — IBGE) conducted the National Health Survey (Pesquisa Nacional de Saúde — PNS), a comprehensive household survey that gathered information in a questionnaire on the Brazilian population, including information on lifestyle and self-reported medical diagnoses of heart disease.

The present study aimed to analyze the risk factors associated with the self-reported medical diagnosis of heart disease in Brazil, according to data from the PNS.

METHODS

PNS is a population-based household survey conducted by the Ministry of Health, in partnership with the IBGE. It had its first edition in 2013. The goal of the PNS is to produce national data on the health and lifestyle of the population, as well as on health care¹⁴.

The PNS has its own design, and is part of IBGE's Integrated Household Survey System (Sistema Integrado de Pesquisas Domiciliares — SIPD). It uses the master sample of this system, which covers more geographical area and provides more accurate estimates. The sampling plan employed was probabilistic sampling in three stages. In the first stage, the subsample of primary sampling units (PSUs) was selected in each stratum of the SIPD master sample. In the second, simple random sample selection of the households was performed in each PSU selected in the first stage. And in the third, using simple random sampling, an adult 18 years of age or older was selected from all of the adult residents of the included households. The final PNS sample consisted of 60,202 individuals aged 18 years and older^{14,15}.

Data collection was performed by trained staff using handheld computers, Personal Digital Assistants (PDA). The PNS questionnaire was divided into three parts: household information; information of all residents; and information about the selected adult resident (aged 18 or older)^{14,15}.

The outcome adopted in this study was a self-reported medical diagnosis of heart disease, characterized by a positive answer to the following question: "Has a doctor ever diagnosed you with a heart disease such as heart attack, angina, heart failure or something else?" To analyze the factors associated with the occurrence of heart disease, the independent variables were organized into three hierarchical blocks: sociodemographic characteristics, health conditions and lifestyle. The hierarchy of variables was established during the conceptual framework and was maintained throughout the statistical analysis.

The variables of the first block, sociodemographic characteristics, were: gender (male, female); age group (18 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 years or older); educational level (no education and incomplete elementary school, completed elementary school and incomplete high school, completed high school and incomplete higher education, completed higher education); and race/skin color (white, dark-skinned black, light-skinned black).

In block two, health conditions included self-evaluated health (good/very good, fair, poor/very poor); self-reported hypertension (no, yes); self-reported diabetes (no, yes); self-reported high cholesterol (no, yes); Body Mass Index (BMI), calculated from the measurement of weight and height of each individual, and categorized according to the World Health Organization (WHO) as eutrophic (BMI < 25 kg/m²), overweight (BMI between 25 and 29.9 kg/m²) and obese (BMI ≥ 30 kg/m²).

In block three, the lifestyles considered were smoking (non-smokers, former smokers, smokers); recommended fruit and vegetable intake five or more days a week (no, yes); consumption of excess fatty meat, which refers to the habit of consuming visible meat fat at least once a week (no, yes); alcohol abuse, which corresponds to five or more doses for men and four or more doses for women on a single occasion within the last 30 days (no, yes); high salt intake, considered high for those who answered that consumption is high or very high (no, yes); insufficiently active in the four areas, referring to individuals who did not perform at least 150 minutes of physical activities, considering leisure, work, commuting and housework (no, yes).

All analyses were performed using Stata software, version 12, and took into account the weights used by the study sample design for the analysis of data from a complex sample.

Initially, a descriptive analysis of all the variables considered was performed, and prevalence estimates were presented in proportions (%), with their respective confidence intervals of 95% (95% CI). In addition to the overall Brazilian prevalence, the prevalence of self-reported heart disease according to Brazilian region and place of residence (urban and rural area) was estimated. To assess the possible factors associated with the occurrence of heart disease, a logistic regression model was used for both univariate and multivariate analyses. The blocks were analyzed separately and inserted sequentially and hierarchically, starting with the sociodemographic block, followed by health conditions and lifestyle. The inclusion of variables in the multiple model occurred among those with $p \leq 0.20$ in the univariate analysis. In the final multivariate analysis, the variables with a p value ≤ 0.05 remained. The values of the Odds Ratio (OR), with a confidence interval of 95% (95%CI) were estimated. The goodness of fit of the model was assessed using the Hosmer-Lemeshow statistic.

The National Health Survey was approved by the National Research Ethics Commission (Comissão Nacional de Ética em Pesquisa — CONEP) of the National Health Council (Conselho Nacional de Saúde — CNS), which regulates research on health involving human beings, through CONEP Report No. 328,159, on June 26, 2013. An informed consent form was signed in the PDA.

RESULTS

60,202 Brazilians aged 18 and older were interviewed. The self-reported medical diagnosis of heart disease was reported by 4.2% (95%CI 4.0 – 4.3) of the population studied, with a higher prevalence in the Southern Region (5.4%; 95%CI 4.6 – 6.1) and the Southeast Region (5.0%; 95%CI 4.3 – 5.6), as well as in urban areas (4.4%; 95%CI 4.0 – 4.7). There was a lower prevalence in the North (2.0%; 95%CI 1.6 – 2.3) and Northeast (3.7%; 95%CI 2.4 – 3.1), as well as in rural areas (3.0%; 95%CI 4.0 – 4.7).

In the univariate analysis, all independent variables were associated with the outcome (Table 1). In the final multivariate model, analyzing the associations between self-reported medical diagnosis of heart disease and sociodemographic characteristics, health conditions and lifestyle, there were higher chances of self-reported heart disease among the following individuals: female (OR = 1.1; 95%CI 1.1 – 1.1), aged over 65 years old (OR = 4.7; 95%CI 3.3 – 5.6), those who assessed themselves with poor/very poor health (OR = 4.1; 95%CI 3.5 – 4.6) or fair health (OR = 2.4; 95%CI 2.2 – 2.7), those with arterial hypertension (OR = 2.4; 95%CI 2.2 – 2.7), those with high cholesterol (OR = 1.6; 95%CI 1.5 – 1.8), overweight individuals (OR = 1.5; 95%CI 1.4 – 1.8) and obese individuals (OR = 2.0; 95%CI 1.7 – 2.2), former smokers (OR = 1.4; 95%CI 1.3 – 1.6) and smokers (OR = 1.2; 95%CI 1.03 – 1.3), those consuming the recommended fruit and vegetable intake (OR = 1.5; 95%CI 1.1 – 1.5) and those who were insufficiently active in the four areas (OR = 1.5; 95%CI 1.02 – 2.1). Protective variables were considered to be self-declared light-skinned black (OR = 0.8; 95%CI 0.7 – 0.8) or dark-skinned black (OR = 0.8; 95%CI 0.6 – 0.8) (Table 2). It is worth noting that the model presented good fit, according to the Hosmer-Lemeshow statistics ($p = 0.962$).

DISCUSSION

In this study, we presented the results of the PNS regarding a previous medical diagnosis of heart disease. About 1 in 20 Brazilian adults have the disease. It was associated with the female gender, the white population and a progressive increase with age. Factors related to health conditions were associated with fair, poor and very poor self-rated health, being overweight, being obese, hypertension and high cholesterol. Regarding lifestyle, the following were associated: former smokers and smokers, inactive people in the four areas, and those reporting consumption of the recommended fruit and vegetable intake.

PNS is the first nationwide study to investigate the self-reported prevalence of heart disease. Although it has limitations, mainly related to memory bias and access to health services, the use of morbidity reported in population surveys has grown due to its simplicity, as it is easy to collect, does not require specific health training, and costs less, ultimately proving effective for national surveillance actions^{16,17}.

In the current study, there was a positive association between heart disease and increasing age, which is already well grounded in the literature and may be justified by the changes inherent

Table 1. Prevalence (%) of adults (≥ 18 years) with a self-reported medical diagnosis of heart disease according to sociodemographic characteristics, health conditions and lifestyle, with a 95% confidence interval (95%CI) — National Health Survey. Brazil, 2013.

Variables	Self-reported heart disease						
	%	95%CI		OR	95%CI		p-value
		Lower	Upper		Lower	Upper	
Total	4.18	4.03	4.34				
Block 1: Sociodemographic characteristics							
Gender							
Male	3.93	3.64	4.25	1.00			
Female	4.40	4.18	4.63	1.13	1.04	1.22	0.004
Age group (years)							
18 to 24	0.83	0.66	1.05	1.00			
25 to 34	1.18	1.00	1.40	1.43	1.09	1.87	0.011
35 to 44	2.51	2.20	2.86	3.07	2.39	3.93	< 0.001
45 to 54	3.77	3.36	4.24	4.67	3.66	5.94	< 0.001
55 to 64	8.21	7.45	9.04	10.64	8.42	13.45	< 0.001
65 and older	12.58	11.84	13.35	17.12	13.60	21.57	< 0.001
Education							
No education and incomplete elementary school	6.30	5.56	7.14	1.00			
Completed elementary and high school	3.06	2.59	3.61	0.47	0.41	0.53	0.002
Completed high school, incomplete higher education	2.47	2.13	2.86	0.38	0.34	0.42	< 0.001
Completed higher education	3.48	3.09	3.91	0.54	0.47	0.61	< 0.001
Race/color							
White	4.89	4.51	5.31	1.00			
Dark-skinned black	3.49	2.99	4.07	0.70	0.60	0.82	< 0.001
Light-skinned black	3.52	3.30	3.75	0.71	0.65	0.77	< 0.001

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Table 1. Continuation.

Variables	Self-reported heart disease						
	%	95%CI		OR	95%CI		p-value
		Lower	Upper		Lower	Upper	
Block 2: Health conditions							
Health status evaluation							
Good/Very good	1.99	1.77	2.24	1.00			
Fair	7.63	6.88	8.45	4.06	3.71	4.44	< 0.001
Poor/very poor	14.14	13.01	15.34	8.09	7.19	9.11	< 0.001
Hypertension							
No	2.07	1.91	2.24	1.00			
Yes	11.93	11.39	12.50	6.42	5.91	6.97	< 0.001
Diabetes							
No	3.61	3.26	4.00	1.00			
Yes	12.72	11.69	13.82	3.89	3.50	4.32	< 0.001
High cholesterol							
No	3.59	3.30	3.91	1.00			
Yes	11.03	10.34	11.76	3.33	3.05	3.63	< 0.001
Body mass index classification							
Eutrophic	3.28	2.92	3.69	1.00			
Overweight	4.69	4.19	5.26	1.45	1.30	1.62	< 0.001
Obese	6.09	5.58	6.64	1.91	1.69	2.16	< 0.001
Block 3: Lifestyle							
Smoking							
Non-smoker	3.33	2.96	3.75	1.00			
Ex-smoker	7.81	6.91	8.81	2.46	2.25	2.69	<0.001
Smoker	3.76	3.38	4.18	1.13	1.00	1.28	0.044
Recommended consumption of fruits and vegetables							
No	3.79	3.50	4.09	1.00			
Yes	4.84	4.57	5.13	1.29	1.19	1.40	0.016

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Table 1. Continuation.

Variables	Self-reported heart disease						
	%	95%CI		OR	95%CI		p-value
		Lower	Upper		Lower	Upper	
Consumption of fatty red meat							
No	4.22	3.87	4.59	1.00			
Yes	3.54	3.31	3.79	0.83	0.76	0.91	< 0.001
Alcohol abuse							
No	4.32	3.43	5.43	1.00			
Yes	1.94	1.54	2.45	0.44	0.35	0.56	< 0.001
High salt intake							
No	4.31	3.82	4.86	1.00			
Yes	3.37	3.01	3.78	0.78	0.68	0.88	< 0.001
Insufficiently active in all four areas ^{oo}							
No	3.32	3.07	3.59	1.00			
Yes	5.19	4.94	5.46	1.59	1.47	1.73	< 0.001

^{oo}Physical activity areas: pleasure, work, commute and home; OR: odds ratio.

in the aging process¹⁸⁻²⁰. Females showed a slightly higher chance of being diagnosed with heart disease, but there is no consensus in the literature with regard to this data. In European countries, CVD has also been described as the leading cause of death among women^{21,22}. However, in the countries of Asia, Africa, and North, Central, and South America, the Global Burden of Disease (GBD) study analysis found higher mortality rates among men^{5,23,24}. One possible explanation for this finding could be the increased demand for health services by women and their increased awareness of the importance of disease prevention and health promotion^{25,26}. This behavior may lead to a higher prevalence of diagnosis among women. Future studies may shed light on whether the prevalence of heart disease is indeed influenced by gender.

Race has been described as an associated factor of CVD, however there is no consensus in the literature. In Brazil, studies conducted in Paraná and Rio Grande do Sul showed a higher occurrence of CVD in white people. This differs from a study on cardiovascular health performed in the country, which showed a higher mortality rate from CVD in black people^{4,27-29}. The same pattern was described by Lotufo³⁰, who identified higher cardiovascular mortality in the elderly, black and mestizo population. Thus, the association between cardiovascular disease and white people, as evidenced in this study, may be due to both a survival bias, since higher mortality may have occurred in the black population, as well as greater access of the white population to health services, with greater opportunities for diagnosis.

Table 2. Multivariate model for adults (≥ 18 years) self-reported medical diagnosis of heart disease according to sociodemographic characteristics, health conditions and lifestyle, with a 95% confidence interval (95%CI) — National Health Survey. Brazil, 2013.

Variables	Self-reported heart disease			
	OR*	95%CI		p-value**
		Lower	Upper	
Gender				
Masculine	1.00			
Feminine	1.09	1.06	1.13	0.002
Age group (years)				
18 to 24	1.00			
25 to 34	1.08	0.80	1.45	0.630
35 to 44	1.87	1.34	2.32	0.015
45 to 54	1.91	1.45	2.50	< 0.001
55 to 64	3.18	2.43	4.15	< 0.001
65 and older	4.66	3.31	5.64	< 0.001
Race/color				
White	1.00			
Dark-skinned black	0.82	0.58	0.81	< 0.001
Light-skinned black	0.79	0.69	0.83	< 0.001
Health status evaluation				
Good/very good	1.00			
Fair	2.44	2.20	2.71	< 0.001
Poor/very poor	4.07	3.46	4.56	< 0.001
Hypertension				
No	1.00			
Yes	2.45	2.22	2.70	< 0.001
High cholesterol				
No	1.00			
Yes	1.62	1.48	1.79	< 0.001

Continue...

Table 2. Continuation.

Variables	Self-reported heart disease			
	OR*	95%CI		p-value**
		Lower	Upper	
Body mass index classification				
Eutrophic	1.00			
Overweight	1.53	1.42	1.78	0.010
Obese	2.01	1.69	2.16	< 0.001
Smoking				
Non-smoker	1.00			
Ex-smoker	1.40	1.30	1.59	< 0.001
Smoker	1.19	1.03	1.34	< 0.001
Recommended consumption of fruits and vegetables				
No	1.00			
Yes	1.50	1.14	1.53	0.048
Insufficiently active in the four areas ^o				
No	1.00			
Yes	1.52	1.02	2.07	< 0.001

^oPhysical activity areas: pleasure, work, commute and home; OR: odds ratio; *adjusted for all of the studied variables;

**Hosmer-Lemeshow statistic = 0.962.

Studies show that chronic diseases have a social gradient that increases with the most socially vulnerable segments of the population, such as less educated individuals and those with low socioeconomic status^{31,32}. In this study, education was excluded from the final adjusted model, which may be explained by the high magnitude among the elderly, who tend to have lower levels of education. Low level of education is one of the most important indicators of the population's health conditions and it is closely related to age in Brazil, as many elderly people in this century did not have opportunities to study in their youth. For this reason, it is essential to consider the assessment of education level as an important factor for promoting health care actions³³.

Self-rated health is an indicator that can be used for various analyses of morbidity and mortality, especially for population groups. The results of the present study demonstrate that individuals who believe they have poorer health (fair and poor/very poor) have a higher chance of being diagnosed with heart disease. Data from the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico — VIGITEL), in 2017,

showed that 4.1% of interviewed individuals evaluated their health status negatively, and this proportion was higher in women¹⁶. A national survey that assessed 12,324 individuals in the five geographic regions of Brazil showed a prevalence of poor self-rated health of approximately 40%, which is growing with the increase in chronic diseases reported³⁵. The poor self-rated health indicator in international and Brazilian literature has been described as predictive of mortality and worse health outcomes^{36,37}. The current study confirmed this association and its magnitude, as it is the second largest OR, serving as an important marker of heart disease.

In this study, the higher chance of diagnosing the disease was shown in individuals who reported high blood pressure and high cholesterol. Hypertension and hypercholesterolemia are recognized as important risk factors for CVD. This intrinsic relationship between hypertension, high cholesterol and cardiovascular risk is demonstrated by several studies. Furthermore, it has also been shown that control can reduce the risk of cardiac events^{28,38,39}. It also highlights the strength of the association between hypertension and heart disease, indicating the importance of health promotion actions and the treatment of hypertensive patients.

Excess weight, which includes the conditions of being overweight and obese, is the second most important risk factor for the global burden of disease and is directly associated with various NCDs, including CVD⁴⁰. In Brazil, the numbers have grown exponentially, as shown by the annual estimates obtained by VIGITEL between 2006 and 2017 that document the breadth and intensity of the obesity epidemic in Brazil: from 11.8% in 2006 to 18.9%, in 2017¹⁶. Data from the present study show that overweight or obese individuals are up to twice as likely to self-report heart disease as compared to eutrophic individuals, highlighting the importance of obesity control in the country in order to achieve to achieve the goals the Strategic Action Plan for Coping with NCDs.

Although the benefits of a healthy lifestyle have been well demonstrated in the literature, the present study showed habits that can negatively affect the cardiac health of the population. There was a greater chance of a self-reported diagnosis of heart disease among individuals who smoked or have smoked during their lifetime. The literature shows that tobacco use is a strong risk factor for CVD, and smoking cessation is a recommended priority measure for the secondary prevention of these diseases^{28,41-43}. In the current study, the strength of the association between former smokers and the previous diagnosis of heart disease was higher than among smokers. The cross-sectional design of the study may explain this finding. Former smokers may have stopped smoking after being diagnosed with CVD and having received guidance on the harmful effects of smoking, thus constituting a reverse causality. This type of situation also occurred in relation to the higher chance of having heart disease in those who consumed an adequate amount of fruits and vegetables, suggesting a possible change in lifestyle and improvement in eating patterns after a medical diagnosis of the disease.

Self-reported heart disease was also associated with insufficiently active individuals in the four areas. The benefits of physical activity are also well known in the literature for

contributing to the reduction of risk factors, such as hypertension and obesity, and, consequently, reducing mortality from cardiovascular disease^{44,45}.

Some potential limitations of the present study should be considered: the data discussed here were limited to analyzing the self-reporting of heart disease, despite the fact that CVD research is frequent in the literature, including cardiac and cerebrovascular pathologies. However, another question about cerebrovascular diseases was used in the PNS, justifying the restriction to heart disease in this investigation. The lack of data from subsample biochemical measurements are not yet available for the validation of self-reported measures of diabetes and high cholesterol. Moreover, as this is a cross-sectional study, the associations described here should be carefully considered and may not portray reality. Ideally, a cohort study would be best suited for assessing exposure and outcome over time. However, cross-sectional population-based studies with representative samples are of great relevance because they are quick, low-cost and very useful for public health. The design and operationalization of the PNS reached an adequate level of quality in the light of the Brazilian context and the generalization of the data is relatively safe for national projections⁴⁶. In addition, the hierarchical conduction of the statistical analysis and the optimal fit of the final model presented in this study should be considered.

CONCLUSIONS

The results showed that approximately 5% of the Brazilian population has heart disease. The importance of knowing the prevalence of heart disease and the associated risk factors in the current Brazilian epidemiological context should be emphasized in order to guide CVD preventative actions, because CVDs represent the leading cause of death in Brazil and around the world.

The PNS data not only corroborated findings from previous national surveys, but also made more representative data available nationwide. Inequality in the distribution of morbidity and mortality due to heart disease in Brazil requires further analysis in order to redirect priorities for disease prevention and treatment, highlighting differences according to gender, age group, race, and geographic region.

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