International Journal of Cardiovascular Research

Hypertension and Associated Factors in Brazilian Adult Population: National Health Survey-2013

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Abstract

Background: Hypertension is an important public health problem in Brazil, and has been affecting individuals of different ages and social strata.

Objective: To determine the prevalence of hypertension and its associated factors in Brazilian adult population.

Methods: Cross-sectional study involving Brazilian adults aged 18 years and older. Data were obtained from the National Health Survey conducted in 2013. A multistage sampling method was used to select a national representative sample of the Brazilian population. The selected sociodemographic variables studied were: sex, age, race, marital status and education level. Behavioral variables included physical activity, smoking status, self-perceived health status and reported salt intake self-perceived. Body Mass Index calculated from weight and height values obtained during household visits. Comorbidities diabetes type 2, high blood cholesterol, cardiovascular diseases, stroke and chronic renal failure were assessed by self-report.

Results: Hypertension increased with age in both sexes, and the men were more likely than women to have that disease in all age categories analyzed. Male sex, older age, not living with partner, low educational level, physically inactive, smoking, overweight, diabetes type 2 and high blood cholesterol were associated with hypertension.

Conclusion: These results reinforce the need for adoption and implementation of measures, based on strategies for prevention, treatment and control of hypertension, still present in expressive way in Brazil and different parts of the world.

Keywords

Hypertension; Prevalence; Mortality; Morbidity; Adult; Brazil

Introduction

Hypertension is a global public-health problem and an important cause of mortality and morbidity in many countries. Despite being one of the most modifiable risks associated for cardiovascular diseases (CVD), the worldwide prevalence of hypertension is rising, and its impact is disproportionately high in low and middle-income countries. According to the WHO's Global Brief on Hypertension, it may be due not only to higher population numbers of these countries compared to high-income countries, but also due to considerable rates of undiagnosed, untreated and uncontrolled people with hypertension usually common in weak health systems [1,2].

It is estimated that CVD will become the leading cause of death and disability, globally, by 2020 [3]. The trend of increasing hypertension prevalence seems to prevail among developing countries. In Latin America, the prevalence of hypertension-given the broad diversity of the region-ranges from 13.4 to 45.5%, and this rates are likely to triple by 2030 [4-6].

In 2013 in Brazil, the study found that the prevalence of adults with high blood pressure was 22.8%, higher in men (25.8%; 95% CI: 24.8-26.7) than in women (20.0%; 95% 19.3-20.8%) [7]. According to the 2010 national census, of the 190 million people in Brazil (130 million adults), 160 million live in urban areas while 30 million live in rural areas [8]. Nowadays the Brazilian population is estimated to be of more than 202 million [9] and once rapid unplanned urbanization is one of the main factors that contribute to the development of hypertension and its complications, extensive and updated data about the prevalence of hypertension and its associated factors would be of urgent public health importance, especially due to an exponential increase in the CVD burden [1].

Thus, considering the complexity, multi-causality, and that the available data on hypertension in 2013 until then refer to the prevalence, and considering that the factors associated with the disease have not yet been adequately elucidated in this population, the deepening and understanding of these predictors constitute justification for this work. In this way, this study aimed to determine the prevalence of hypertension and its associated factors in Brazilian adult population.

Methods

This is a cross-sectional population-based study involving Brazilian adults aged 18 years and older. Data were obtained from the National Health Survey, a nationally representative household survey conducted by the Brazilian Institute of Geography and Statistics (IBGE) and Ministry of Health in 2013 [10]. A multistage sampling method was used to select a national representative sample of the Brazilian population. The primary sampling units were census tracts based on the 2010 census and randomly selected from the IBGE national master sampling plan. Within each census tract households were randomly selected from a national registry of addresses. Within selected households a randomly selected respondent aged 18 years or older was invited to take part in the survey.

Initially, 79,875 households were selected. Upon completion of data collection, the final sample size was 64,348 households with an overall response rate of 78%. Person-level survey weights were calculated taking into account the probability of selection as well as non-response rates. For the purpose of this study, the data of adults selected within each domicile to answer the individual interview and

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whose blood pressure was measured were analyzed. Thus, our sample consisted of 59.402 individuals.

Respondents were classified as having hypertension if systolic blood pressure measurement of ≥ 140 mmHg or a diastolic measurement of ≥ 90 mmHg (n=12.662 adults). Blood pressure was measured by trained professionals using a properly calibrated automatic device. Details on the procedures performed in the measurement of blood pressure can be found in previous publication [11].

The selected sociodemographics variables studied were sex, age, race, marital status and education level. Behavioral variables included physical activity (inactive, <10 min/wk; insufficient, 10–149 min/wk; active, ≥150 min/wk of moderate-intensity equivalent physical activity); smoking status (current, former, none); and evaluation health status (very good, good, regular, bad, too bad) and reported salt intake (very low, low, appropriate, high, very high) were ascertained by self-perceived. Body Mass Index (BMI) calculated from weight and height values obtained during household visits. Overweight, categorized as yes and no, was assessed according to BMI cut-off points. In the individuals aged between 18 and 59 years, the values ≥ 25 kg/m² were considered overweight [12]. For those aged 60 or over [13], we considered values>27 kg/m². Diabetes type 2, high blood cholesterol, cardiovascular diseases, stroke, chronic renal failure, were ascertained by self-report.

Statistical analysis

In all of the analyses, the effects of complex sampling were considered. First, we described participant characteristics by weighted frequencies. Hypertension prevalence in the population was then calculated at a 95% confidence interval (CI). To identify factors related to hypertension prevalence, we calculated prevalence ratio (PR) using bivariate analysis and calculated the adjusted PR by a multiple regression of Poisson model with robust variance. In this model, all of the variables were analyzed simultaneously. We preferred to use this more conservative model that included all of the variables to allow for better confounding adjustment. Other models that included only the most significant variables were tested and did not change the significance of the variables. Associations were considered to be statistically significant when *p*<0.05. The STATA software version 13.0 was used for all of the calculations.
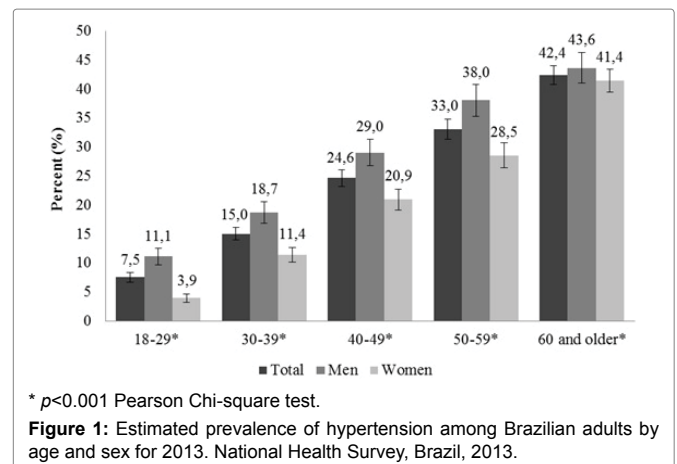
Ethical Aspects

The National Health Survey-2013 was approved by the Brazilian National Commission on Ethics in Research (CONEP) of the National Health Council (CNS). All participants signed a term of free and informed consent.

Results

In 2013, hypertension increased with age for both sexes, being that Brazilian men were more likely than women to have hypertension in every age category. The difference in the prevalence of hypertension between men and women increased with age (with the exception of the 60 and over age group where rate were 2.2%), from 7.2% among those aged 18-29, to 7.3% among those 30-39, to 8.9% among those 40-49, to 9.5% among those 50-59 (Figure 1).

The prevalence of hypertension was also significantly higher among black adults (27.5%, 95% CI 25.48-29.63, p<0.001), and among married or living as if married individuals (23.7%, 95% CI 20.33-22.23, p<0.001). Among the Brazilian population, there is an inverse

* *p*<0.001 Pearson Chi-square test.

Figure 1: Estimated prevalence of hypertension among Brazilian adults by age and sex for 2013. National Health Survey, Brazil, 2013.

association between schooling and hypertension: while than 24% (95% CI 22.71-25.35, p<0.001) of the individuals with 5-8 schooling years and more reported having hypertension, the same condition was observed among 40.8% (95% CI 38.88-42.79, p<0.001) of the adults with up to 4 years of schooling (Table 1).

The prevalence of hypertension was significantly high (p<0.001) among individuals with bad (32.0%, 95% CI 29.06-35.01) or too bad (34.6%, 95% CI 28.93-40.79) self-perceived health status. Behavioral associated factors for self-reported hypertension such as being physically inactive was more likely to be identified among hypertensive patients (p<0.001). However, it was observable higher prevalence of high blood pressure among adults who reported self-perception of very low salt consumption. Cigarette smoking was significantly associated with hypertension in the bivariate analysis (Table 1).

Overweight individuals had a higher prevalence of hypertension (26.9%, 95% CI 26.0-27.86 *vs* 17.9%, 95% CI 17.12 to 18.74, p<0.001). Overweight was significantly higher (p<0.001) in women compared to men (55.0%, 95% CI 54.01-56.03 *vs* 52.5%, 95% CI 51.29-53.63). Diabetes type 2, high blood cholesterol, cardiovascular diseases, stroke and chronic renal failure, were significantly associated (p<0.001) with hypertension (Table 1).

In the multivariate analysis, male sex, older age, not living with partner, low educational level, physically inactive, smoking, overweight, diabetes type 2 and high blood cholesterol remained associated with hypertension (Table 2).

Discussion

The prevalence of hypertension observed in Brazil in 2013 is similar to the prevalence rates of self-reported hypertension observed in the period between 2006 and 2011 in Brazil [4]. In the 2000's, the pooled prevalence estimates of self-reported hypertension in Brazil obtained through home surveys was 25.2% [14]. In a study aimed to compare hypertension prevalence in seven major Latin American cities, the overall weighted prevalence of hypertension was 16.3%, ranging from 13.4% to 44.2%, while the prevalence of self-reported hypertension was 32.8% in the United States in 2011 among adult individuals [5,15]. The prevalence observed in our study was similar to that described in nationwide studies [16-18].

The prevalence of hypertension by the analyzed sociodemographic characteristics was higher among those aged ≥ 60 years, and among

Variables	Total		Hypertension		(CI 95%)²	p value**
	N'	%'	n'	%²		
Sociodemographics						
Age groups, years						<0.001
18-29	13,822	25.7	901	7.5	(6.75-8.43)	
30-39	14,003	21.5	1,846	15.0	(13.92-16.11)	
40-49	11,370	18.2	2,622	24.6	(23.18-26.08)	
50-59	9,030	16.4	2,786	33.0	(31.26-34.8)	
≥ 60	11,177	18.2	4,507	42.4	(40.74-44.03)	
Race/ethnicity *						<0.001
Asian	525	0.9	110	23.3	(17.49-30.43)	
Latin	29,066	42.0	5,901	21.8	(20.81-22.78)	
Native Americans	412	0.4	78	18.6	(13.15-25.66)	
White	23,828	47.5	5,208	22.7	(21.76-23.74)	
Black	5,568	9.2	1,364	27.5	(25.48-29.63)	
Marital status						<0.001
Not living with partner	25,507	39.0	5,713	21.3	(20.33-22.23)	
Living with partner	33,895	61.0	6,949	23.7	(20.33-22.23)	
Education level, years*						<0.001
≤ 4	7,624	16.1	2,927	40.8	(38.88-42.79)	
5-8	15,068	29.7	3,387	24.0	(22.71-25.35)	
9-11	18,237	37.5	2,896	16.9	(15.91-17.99)	
>11	8,474	16.6	1,358	18.0	(16.54-19.54)	
Behavioral aspects						
Self-perceived health status						<0.001
Very good	7,315	13.2	1,108	14.8	(13.3-16.35)	
Good	31,188	52.7	5,780	20.4	(19.57-21.3)	
Regular	17,052	28.2	4,572	28.9	(27.58-30.22)	
Bad	3,084	4.7	960	32.0	(29.06-35.01)	
Too bad	763	1.2	242	34.6	(28.93-40.79)	
Self-perceived salt intake						<0.001
Very low	1,848	2.9	604	32.4	(28.45-36.66)	
Low	14,053	22.5	3,830	28.7	(28.45-36.66)	
Appropriate	35,450	60.5	6,675	20.5	(19.69-21.36)	
High	6,977	12.3	1,365	21.4	(19.85-23.13)	
Very high	1,074	1.9	188	18.0	(14.56-21.93)	
Physical activity						<0.001
Yes	17,799	31.7	2,901	17.7	(24.33-25.95)	
No	41,603	68.3	9,761	25.1	(16.69-18.7)	
Smoking						<0.001
No	50,716	85.2	10,522	22.1	(21.43-22.79)	
Comorbidities						
Overweight*						<0.001
No	27,381	46.2	4,715	17.9	(17.12-18.74)	
Yes	32,021	53.8	7,947	26.9	(26.0-27.86)	
Diabetes type 2*						<0.001
No	48,660	92.9	9,971	21.8	(21.13-22.58)	
Yes	3,628	7.1	1,411	42.2	(39.25-45.11)	
High blood cholesterol*						<0.001
No	43,567	85.3	9,031	21.9	(21.13-22.6)	
Yes	7,266	14.7	2,128	32.9	(30.87-35.07)	
Cardiovascular diseases						<0.001
No	57,174	95.8	11,989	22.4	(21.77-23.13)	
Yes	2,228	4.2	673	30.0	(27.11-33.14)	
Stroke						<0.001
No	58,436	98.5	12,291	22.5	(21.81-23.15)	

Yes	966	1.5	371	41.3	(35.53-47.35)	
Chronic renal failure						<0.001
No	58,566	98.6	12,415	22.6	(21.98-23.34)	
Yes	836	1.4	247	30.5	(25.53-35.92)	

CI 95%- 95% confidence interval.
¹ Number of subjects in the non-weighted sample;
² Prevalence and 95% confidence intervals (CI 95%) calculated under weights due to the sampling design;
* The totals differ due to losses in the variable;
** *p* value of Pearson Chi-square test.
Table 1: Sociodemographics and behavioral characteristics, comorbidities and prevalence rate of hypertension among Brazilian adults. National Health Survey, Brazil, 2013.

Variables	Crude prevalence ratios			Adjusted prevalence ratios*		
	PR¹	(CI 95%)²	*p*	PR¹	(CI 95%)²	*p*
Sociodemographics						
Sex						
Women	1	-	-	1	-	-
Men	1.28	(1.21-1.35)	<0.001	1.44	(1.36-1.53)	<0.001
Age groups, years						
18-29	1	-	-	1	-	-
30-39	1.98	(1.74-2.25)	<0.001	1.67	(2.16-2.90)	
40-49	3.25	(2.87-3.68)	<0.001	2.50	(2.16-2.90)	<0.001
50-59	4.37	(3.87-4.93)	<0.001	3.05	(2.63-3.54)	<0.001
≥ 60	5.61	(4.99-6.30)	<0.001	4.04	(3.50-4.67)	<0.001
Marital status						
Not living with partner	1	-	-	1	-	-
Living with partner	1.11	(1.05-1.17)	<0.001	0.89	(0.84-0.95)	0.001
Education level, years*						
≤ 4	1.70	(1.58-1.82)	<0.001	1.06	(0.98-1.15)	0.098
5-8	1	-	-	1	-	-
9-11	0.70	(0.65-0.76)	<0.001	0.86	(0.79-0.93)	<0.001
>11	0.74	(0.67-0.82)	<0.001	0.76	(0.69-0.84)	<0.001
Behavioral aspects						
Physical activity						
Yes	1	-	-	1	-	-
No	1.42	(1.33-1.51)	<0.001	1.11	(1.04-1.19)	0.002
Smoking						
No	1	-	-	1	-	-
Yes	1.20	(1.11-1.29)	<0.001	1.11	(1.01-1.21)	0.017
Comorbidities						
Overweight*						
No	1	-	-	1	-	-
Yes	1.50	(1.42-1.58)	<0.001	1.45	(1.36-1.54)	<0.001
Diabetes type 2*						
No	1	-	-	1	-	-
Yes	1.92	(1.78-2.08)	<0.001	1.17	(1.07-1.28)	<0.001
High blood cholesterol*						
No	1	-	-	1	-	-
Yes	1.50	(1.40-1.61)	<0.001	1.08	(1.00-1.17)	0.029

¹PR: prevalence ratios calculated under weights due to the sampling design;
²CI 95%: 95% confidence intervals (CI 95%) calculated under weights due to the sampling design;
*Adjusted for all other variables in the table
Table 2: Multiple regression of Poisson to hypertension among Brazilian adults, according to sociodemographics, behavioral and comorbidities. National Health Survey, Brazil, 2013.

black adults, men, married or living as if married individuals, and among people with low educational levels. The prevalence of hypertension has increased with age in both sexes and was higher in men than in women at all ages. This difference increased with age.

Since global prevalence of overweight is higher among women than men [19], we assessed the association between overweight and sex. Similarly, our study shows that overweight was more prevalent among women than men. Multivariate regression analysis also showed

that diabetes type 2 and high blood cholesterol were significantly associated with hypertension. Overall, most of the present study's findings align with several epidemiological studies that have revealed an association between hypertension sociodemographic, clinical, and lifestyle factors [18,20-22].

We also found a significant inverse linear relationship between self-perceived consumption of salt and hypertension prevalence rate in Brazil, but this relationship was not maintained in the final model. Still, draws attention the fact that traditionally, high salt intake has been identified as a risk factor for the occurrence of hypertension, and that the current guidelines [23,24] and several studies [25,26] are categorically recommend a low salt intake as a way to reduce blood pressure. It is worth noting that hypertension is considered a lifestyle disease, and the success of your treatment is directly related to accession lifestyle guidelines recommended by health professionals. In a study with 10.773 adults-designed to assess adherence to lifestyle recommendations by individuals who were aware of their hypertension-Kim and Kong noted that reducing salt intake was only slightly higher among those aware of their condition status [27-29]. Thus, we believe that the inverse association similar between a associated factor of hypertension and its prevalence observed in our study suggests a change in the pattern of behavior motivated by diagnosis or awareness of the disease, in addition to knowledge of the implications of the lifestyle of hypertensive patients on the clinical manifestations of the disease. Thus, monitoring of the health service and the perception of hypertension appear to have led to a reduction in self-perceived daily salt consumption. Although previous studies have shown that better control of blood pressure reflects improvements in awareness of hypertension and lifestyle changes may be associated with newly diagnosed hypertensive patients, reductions of the entire population in daily salt consumption among hypertensive patients were not commonly reported in the literature.

Additionally, we verified that the self-perceived health despite having been significantly associated with hypertension in the bivariate analysis, this relationship also did not remain in the final explanatory model. As an independent predictor of mortality, poor self-perceived health status can lead to a lower engagement in preventive health practices and disease treatment [30]. In addition, changes in self-reported health can induce life-style changes which may have a delayed effect on health. Harrington and his colleagues found that the food quality is influenced by the core life behaviors and poor general state of self-perceived health is associated with poor-quality diet [31], which is contrary to the results observed when self-perceived consumption of salt. However, as this study looked at self-perceived consumption of salt intake, it may be that individual perception simply plays the medical discourse, not representing the total real consumption practiced by individuals.

Our study had limitations. For example, the cross-sectional design does not allow establishing cause and effect relationships, which makes it difficult to assess whether the factors identified as associated with hypertension are a consequence of preceded by the occurrence of the disease. Therefore, it is suggested to carry out studies with longitudinal drawings, in order to establish the temporal relationship among causal factors and the study outcome. In addition, it should be noted that although the procedures were standardized and the professionals trained, blood pressure measurement was performed using a digital automatic device, not traditional stethoscope [32,33]. Regarding self-reported morbidities, it is known that this method may result in an underestimation of the prevalence of injuries among individuals, however self-report morbidity remains one of the most widely used methods in clinical and public health research, and it has been found to be significantly associated with important outcome measures such as mortality, general health status, physical well-being, emotional well-being, among others [30,34].

Conclusion

Overall, hypertension is prevalent in about one-fifth of Brazilian adults, and being more predominant in men. The factors that presented a consistent association and greater chance of disease were: male sex, older age, not living with partner, low educational level, physically inactive, smoking, and overweight, diabetes type 2 and high blood cholesterol. These results reinforce the need for adoption and implementation of measures, based on strategies for prevention, treatment and control of hypertension in various sectors, which contribute to promotion and maintenance of healthy, lifestyles, as well reducing the burden of disease and complications, still present in expressive way, in Brazil and different parts of the world.

Conflict of Interests

The authors declare no conflicts of interest.

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