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Prevalence of arterial hypertension according to different diagnostic criteria, National Health Survey

Prevalência da hipertensão arterial segundo diferentes critérios diagnósticos, Pesquisa Nacional de Saúde

Deborah Carvalho Malta[I], Renata Patrícia Fonseca Gonçalves[I], Ísis Eloah Machado[I], Maria Imaculada de Fátima Freitas[I], Cimar Azeredo[II], Celia Landman Szwarcwald[III]

ABSTRACT: ***Objective:*** To determine the population prevalence of arterial hypertension in adults according to different diagnostic criteria. ***Methods:*** This is a cross-sectional study, analyzing information from the Brazilian National Health Survey in 2013, consisted of interviews, physical and laboratory measurements (n = 60,202). The prevalence of hypertension was defined according to three diagnostic criteria: self-reported; measured by instrument (blood pressure ≥ 140/90 mmHg); measured and/or using medication. Prevalence and 95% confidence interval (95%CI) were estimated by the three diagnostic criteria of hypertension. ***Results:*** The high blood pressure measurements were: 21.4% (95%CI 20.8 – 22.0) using the criterion self-reported; 22.8% (95%CI 22.1 – 23.4) by measured hypertension; and 32.3% (95%CI 31.7 – 33.0) by measured hypertension and/or reported use of medication. Women presented higher prevalence for the self-reported criterion (24.2%; 95%CI 23.4 – 24.9) and men, for the measured criterion (25.8%; 95%CI 24.8 – 26.8). Hypertension increases with age and is more frequent in urban areas. Using these three criteria, the hypertension was higher in the Southeast and South regions, in relation to the average of the country and the other regions. Using these three criteria, hypertension increased with age, was more frequent in urban areas and in the Southeast and South regions, in relation to the average of the country and the other regions. ***Conclusion:*** These findings are important to support policies that aim to achieve the World Health Organization's goal of reducing hypertension by 25% over the next decade.

Keywords: Hypertension. Health surveys. Cardiovascular diseases. Chronic disease.

[I]Nursing School, Universidade Federal de Minas Gerais – Belo Horizonte (MG), Brazil.
[II]Coordenação de Trabalho e Rendimento, Instituto Brasileiro de Geografia e Estatística – Rio de Janeiro (RJ), Brazil.
[III]Instituto de Comunicação e Informação Científica e Tecnológica em Saúde, Fundação Oswaldo Cruz – Rio de Janeiro (RJ), Brazil.
Corresponding author: Deborah Carvalho Malta. Avenida Alfredo Balena, 190, CEP: 30130-100, Belo Horizonte, MG, Brasil. E-mail: dcmalta@uol.com.br
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RESUMO: ***Objetivo:*** Determinar a prevalência populacional de hipertensão arterial em adultos, segundo diferentes critérios diagnósticos. ***Métodos:*** Trata-se de um estudo transversal, que analisa informações da Pesquisa Nacional de Saúde de 2013, que consistiu em entrevistas, medidas físicas e laboratoriais da população brasileira (n = 60.202). A prevalência de hipertensão arterial foi definida segundo três critérios diagnósticos: hipertensão autorreferida; medida por instrumento (pressão arterial ≥ 140/90 mmHg); medida e/ou em uso de medicamentos anti-hipertensivos. Foram estimadas as prevalências de hipertensão arterial segundo os três critérios diagnósticos e seus respectivos intervalos de confiança de 95% (IC95%). ***Resultados:*** As prevalências de hipertensão arterial encontradas foram: 21,4% (IC95% 20,8 – 22,0) utilizando-se o critério autorreferido, 22,8% (IC95% 22,1 – 23,4) para hipertensão arterial medida e 32,3% (IC95% 31,7 – 33,0) para hipertensão arterial medida e/ou relato de uso de medicação. As mulheres apresentaram prevalências de hipertensão mais elevadas no critério autorreferido (24,2%; IC95% 23,4 – 24,9). Entre os homens, a prevalência foi maior no critério hipertensão arterial medida (25,8%; IC95% 24,8 – 26,7). Utilizando os três critérios, a hipertensão arterial aumentou com a idade, foi mais frequente na região urbana e maior nas regiões sudeste e sul, em relação à média do país e às demais regiões. ***Conclusão:*** Estes resultados são importantes para apoiar políticas que visem atingir a meta da Organização Mundial de Saúde de redução da hipertensão em 25% na próxima década.

Palavras-chave: Hipertensão. Inquérito epidemiológico. Doenças cardiovasculares. Doença crônica.

INTRODUCTION

The World Health Organization (WHO) estimates that about 600 million people have Arterial Hypertension (AH), with global increase of 60% of cases until 2025, besides the approximate number of 7.1 million annual deaths[1]. AH leads to increasing costs for the health system, with major socioeconomic impact[2,3]. AH represents the main risk factor for Cardiovascular Disease (CVD), and is responsible for a significant contribution in the global burden of diseases and in the missed years of life adjusted for incapacity[4,5]. High levels of Blood Pressure (BP) increase the chances of coronary arterial disease, heart failure, encephalic vascular disease, chronic kidney failure and death[6,7].

In Brazil, population surveys have used questionnaires to obtain self-reported information, due to their simplicity and reduced costs in the application of the technique[8-10]. One example is the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel), which pointed to the prevalence of AH in the past decade, affecting about one quarter of the Brazilian adult population[8,11]. Therefore, self-reported AH is an indicator that can be used when it is not possible to measure the BP; however, this criterion may underestimate the diagnosis[12].

The use of devices to measure BP at a population scope requires the standardization of measurement techniques, consensus over the diagnostic criteria, quality of equipment and skills from the collection team, which leads to the increasing complexity of the research planning, besides higher costs[9,13,14]. Thus, most population studies estimates self-reported AH, because collection is simpler[8].

Analyses with measured BP are scarce in the Brazilian population, and most studies are local, with great variability of information, which does not allow the comparison of data[15]. Besides, there are different diagnostic criteria to estimate the population prevalence of AH[15-18]. The WHO considers AH when the measurement is above 140 mmHg, and/or diastolic pressure equal to or higher than 90 mmHg[1,16], whereas other studies consider the measurement equal to or higher than 140 mmHg/90 mmHg, or currently using anti-hypertension medication[15,17,18].

In 2013, the Brazilian National Health Survey (NHS), national survey carried out by the Brazilian Institute of Geography and Statistics (IBGE), used both referred measurements and measured ones to calculate the AH in the Brazilian population. The inclusion of these measurements in the NHS resulted in a great advance for public health, enabling the better evaluation of the extension of the problem in the population[9,14]. In the same year, the Global Action Plan to Prevent and Control Non-Communicable Diseases was approved in the Global Health Assembly, in Geneva, including a set of indicators to face non-communicable chronic diseases (NCCD), with the goal of reducing the prevalence of high BP in 25%, until 2025 [16]. This goal must be continuously monitored by the countries[16].

The NHS constitutes an essential instrument to monitor these indicators. Its survey included questions about self-reported AH and that previously diagnosed by doctors, the use of anti-hypertension medication, besides the measurement of BP in adults, which made it possible to compare different diagnostic criteria to analyze the different measurements[9,14].

Therefore, the objective of this study was to determine the population prevalence of AH in adults, according to different diagnostic criteria, using the information from the NHS.

METHODS

The NHS is a cross-sectional analysis conducted in 2013. The NHS is a household epidemiological survey, carried out by IBGE, together with the Ministry of Health, representative of Brazil, its great regions, Federation Units (FU), metropolitan regions and capitals[14,19].

The NHS 2013 sample was composed of 64,348 households. The residents selected, who underwent a specific interview about their health status, life style and chronic conditions, accounted for 60,202. The loss rate was 20.8%, and the non-response rate was 8.1%[14,19].

The sampling plan of the NHS had three stages: the Primary Sampling Units (PSU) were the census sectors or the set of sectors; the secondary units were the households; and the tertiary units were the adults living in the household (≥ 18 years). Since the NHS was part of the Integrated System of Household Studies (ISHS), from IBGE, the PSU considered in the research are a sub-sample of the set of PSU in the master sample of IBGE. The household selection was carried out based on the most recent version, available at the time, of the National Address Records for Statistical Purposes (NARSP). The investigation of the specific health-related subjects was performed with a single adult resident selected in each household, after a simple random sample[14,19].

Considering the different possibilities of obtaining the population diagnosis of AH in the NHF, the following criteria were compared:

- Self-reported AH: calculated according to the answers to the following question in the NHS: "Has any doctor ever told you you have arterial hypertension? (yes, no)", and the individuals who answered yes were calculated as hypertensive;
- AH measured by instrument: BP was measured by a trained team, using a calibrated digital device. Three BP measurements were taken, with two-minute intervals in-between them. The measurements were, then, inserted in a smartphone. The mean BP between the second and the third measurements was used for this study[9,14]. The missing data were input by the IBGE team, using a set of integrated computer routines of the system called CIDAQ (critic and input of quantitative data), which considered the combined behavior of all registered variables: age, sex, weight, height, and per capita family income. The routines to measure BP were in a protocol that included being at rest, emptying the bladder, not drinking or smoking for 30 minutes, not performing physical activities for one hour before the measurement, which should be taken while the person was sitting down, having rest for at least five minutes, among others. More details can be observed in other studies [9,14]. Considering that the BP can get higher while checkin, it is recommended a validation throwgh two or more ocasions in order to diagnose the AH. However, in this study it was considered hypertensive the who showed BP ≥ 140/90 mmHg in a single blood pressure checking, once it was impossible new measurement to the adapted sample.
- AH measured by an instrument and/or while using anti-hypertensive medication. The third diagnostic criterion consisted on combining the BP measurement ≥ 140/90 mmHg and/or on referring the use of drugs for arterial hypertension, calculated based on the positive responses to the following questions in the NHS: "Have you taker any medication for arterial hypertension (high blood pressure) during the last two weeks?".

This study described the prevalence of individuals with AH according to the three diagnostic criteria: self-reported; measured BP ≥ 140/90 mmHg; BP ≥ 140/90 mmHg and/or while using anti-hypertensive medication. The prevalence rates and 95% confidence intervals (95%CI) were estimated for the three diagnostic criteria of AH for the Brazilian adult population, according to sex, Brazil, regions, urban and rural, and 27 FU. AH was also calculated by age group for each diagnostic criterion, for the total population. In the calculation of prevalence rates, the survey module of the software Stata 14 was used to correct the effect of the sampling plan caused of the PSU conglomeration in the estimates of the population surveys.

NHS was approved by the National Ethics Commission for Human Research, of the Ministry of Health. The consent form was signed in the smartphone during the NHS.

RESULTS

Table 1 presents the prevalence of AH according to the three different diagnostic criteria (self-reported AH, measured by instrument BP ≥ 140/90 mmHg and measured BP ≥ 140/90 mmHg and/or

while using anti-hypertensive medication). The measurements for the Brazilian adult population were, respectively, 21.4% (95%CI 20.8 – 22.0); 22.8% (95%CI 22.1 – 23.4), and 32.3% (95%CI 31.7 – 33.0). Self-reported AH was higher in the urban region and in the Southeast and South regions. The prevalence of AH in the three diagnostic criteria was also higher in the Southeast and South regions in relation to the mean in the country and the other regions. Women presented higher prevalence rates for the self-reported criterion, and men, for the measured criterion (Table 1).

For the total population, the prevalence of AH according to the self-reported criterion ranged from 13.1% (95%CI 11.3 – 14.9) in Pará to 24.9% (95%CI 22.7 – 27.1) in Rio Grande do Sul. The variation of AH according to the measured criterion was 13.3% (95%CI 11.7 – 15.1) in Amazonas, to 27.6% (95%CI 25.3 – 30.0) in Rio Grande do Sul. Regarding the measured AH and/or report of use of medication criterion, the lowest prevalence was 17.8% (95%CI 16.0 – 19.7), and the highest prevalence was 39.3% (95%CI 36.8 – 41.8) in Amazonas and Rio Grande do Sul, respectively (Table 2).

In Table 3, the prevalence among men according to the self-reported AH criterion ranged from 9.3% (95%CI 6.8 – 11.9) in Maranhão to 21.5% (95%CI 18.7 – 24.4) in Rio Grande do Sul. Using the measured AH, the variation was 15.1% (95%CI 16.4 – 13.9) in Amazonas to 31.8% (95%CI 28.3 – 35.5) in Rio Grande do Sul. Using AH and/or report of use of medication, the lowest frequency was 18.4% (95%CI 16.0 – 21.2), and the highest was 40.8% (95%CI 37.2 – 44.4), in Amazonas and Rio Grande do Sul, respectively.

Among the female participants, the prevalence of self-reported AH ranged from 14.8% (95%CI 12.1 – 15.5) in Pará to 28.0% (95%CI 24.8 – 31.1) in Minas Gerais. In the measured AH criterion, the variation was of 10.2% (95%CI 8.3 – 12.6) in Amazonas, and 25.1% (95%CI 20.7 – 30.1) in Santa Catarina. According to the measured AH criterion and/or with report of use of medication, the lowest frequency of AH was observed in Amazonas, with 17.1% (95%CI 14.9 – 19.6), and the highest frequency, in Rio Grande do Sul, with 37.9% (95%CI 34.5 – 41.4) (Table 4).

In all of the analyzed criteria, there was an increase in AH with age, reaching 71.7% for individuals aged more than 70 years, with high BP and / or reported use of medication. Self-reported AH tends to stabilize after the age of 60 or more, around 60% (Figure 1).

DISCUSSION

This is the first national study comparing three diagnostic criteria to measure the prevalence of AH at a population scope (self-reported, measured BP ≥ 140/90 mmHg, BP ≥ 140/90 mmHg or use of medication), analyzing the data from the NHS. The prevalence of hypertension ranged between one fifth and one third of the Brazilian adult population, depending on the adopted criterion, being higher for the criterion measured AH and/or in use of medication. In the general population, measured AH presents higher prevalence rates than self-reported AH, even if they are close. By analyzing by gender, self-reported AH is higher among women, whereas measured AH is higher among men. Measured AH reached one fourth of the male population and one fifth of the female population. When the diagnosis was made by a criterion measured AH and/or use of medication, the differences according to sex were not

Table 1. Arterial hypertension and 95% confidence intervals according to the criteria: self-reported blood pressure; measured blood pressure ≥ 140/90 mmHg; and blood pressure ≥ 140/90 mmHg or use of medications. Adults, Brazil, urban and rural and regions.

Regions	Self-reported BP		BP ≥ 140/90 mmHg measured		BP ≥ 140/90 mmHg measured and/or use of medications	
	%	95%CI	%	95%CI	%	95%CI
Total						
Brazil	**21.4**	20.8 – 22.0	**22.8**	22.1 – 23.4	**32.3**	31.7 – 33.0
Urban	**21.7**	21.0 – 22.3	**22.0**	21.0 – 21.9	**33.1**	31.5 – 32.9
Rural	**19.8**	18.6 – 21.0	**19.3**	18.6 – 21.7	**32.1**	31.6 – 34.6
North	**14.5**	13.6 – 15.5	**14.6**	13.4 – 15.8	**20.5**	19.3 – 21.8
Northeast	**19.4**	18.5 – 20.4	**21.0**	20.1 – 21.9	**29.4**	28.4 – 30.4
Southeast	**23.3**	22.3 – 24.3	**25.0**	23.8 – 26.1	**35.5**	34.4 – 36.7
South	**22.9**	21.5 – 24.3	**25.0**	23.5 – 26.1	**35.0**	33.5 – 36.5
Center-West	**21.2**	20.0 – 22.4	**20.0**	18.8 – 21.2	**30.2**	28.9 – 31.5
Male						
Brazil	**18.3**	17.5 – 19.1	**25.8**	24.8 – 26.7	**33.0**	32.1 – 34.0
Urban	**18.8**	17.9 – 19.7	**21.3**	19.7 – 22.2	**33.1**	32.0 – 34.2
Rural	**15.2**	13.7 – 16.6	**17.8**	16.7 – 20.3	**32.5**	30.4 – 34.7
North	**12.5**	10.9 – 14.1	**16.4**	14.7 – 18.2	**20.6**	18.7 – 22.5
Northeast	**15.5**	14.1 – 16.9	**24.2**	22.7 – 25.8	**29.5**	28.0 – 31.1
Southeast	**20.4**	19.0 – 21.7	**28.4**	26.6 – 30.2	**36.9**	35.1 – 38.7
South	**20.1**	18.2 – 22.1	**27.3**	25.1 – 29.5	**35.7**	33.5 – 37.9
Center-West	**18.4**	16.7 – 20.2	**22.8**	21.0 – 24.6	**30.5**	28.5 – 32.6
Female						
Brazil	**24.2**	23.4 – 24.9	**20.0**	19.3 – 20.8	**31.7**	30.9 – 32.5
Urban	**24.1**	23.3 – 24.9	**19.6**	16.7 – 20.7	**31.4**	30.5 – 32.3
Rural	**24.7**	22.6 – 26.8	**17.8**	15.9 – 20.2	**33.6**	31.6 – 35.7
North	**16.5**	15.0 – 17.9	**12.7**	11.3 – 14.3	**20.4**	18.8 – 22.2
Northeast	**23.0**	21.8 – 24.2	**18.1**	17.0 – 19.2	**29.3**	28.2 – 30.4
Southeast	**25.9**	24.5 – 27.2	**21.9**	20.6 – 23.3	**34.3**	32.9 – 35.9
South	**25.4**	23.4 – 27.3	**22.8**	21.0 – 24.7	**34.3**	32.3 – 36.4
Center-West	**23.8**	22.3 – 25.3	**17.3**	15.8 – 19.0	**29.9**	28.3 – 31.5

BP: blood pressure; 95%CI: 95% confidence interval.

Table 2. Arterial hypertension and 95% confidence interval according to the criteria: self-reported blood pressure; measured blood pressure ≥ 140/90 mmHg; and measured blood pressure ≥ 140/90 mmHg or use of medications. Adults, per state.

States	Self-reported BP		BP ≥ 140/90 mmHg measured		BP ≥ 140/90 mmHg measured and/or use of medications	
	%	95%CI	%	95%CI	%	95%CI
Rondônia	**18.1**	15.6 – 20.6	**15.6**	14.0 – 17.4	**23.7**	21.3 – 26.2
Acre	**16.1**	14.3 – 17.9	**15.6**	13.9 – 17.6	**22.8**	20.9 – 24.8
Amazonas	**13.7**	12.2 – 15.2	**13.3**	11.7 – 15.1	**17.8**	16.0 – 19.7
Roraima	**14.2**	12.1 – 16.3	**15.3**	13.5 – 17.3	**21.4**	19.5 – 23.5
Pará	**13.1**	11.3 – 14.9	**14.5**	12.5 – 16.9	**19.7**	17.5 – 22.1
Amapá	**13.3**	11.0 – 15.5	**16.4**	14.1 – 19.0	**20.3**	17.9 – 22.9
Tocantins	**19.6**	17.4 – 21.8	**14.7**	12.7 – 16.9	**25.7**	23.1 – 28.5
Maranhão	**13.6**	11.2 – 16.1	**17.2**	14.3 – 20.5	**23.6**	21.2 – 26.3
Piauí	**19.3**	17.0 – 21.6	**18.3**	15.9 – 20.9	**27.8**	25.4 – 30.4
Ceará	**18.7**	16.9 – 20.6	**20.5**	18.6 – 22.5	**29.2**	27.0 – 31.5
Rio Grande do Norte	**20.8**	18.8 – 22.9	**19.1**	16.8 – 21.7	**30.3**	27.8 – 32.9
Paraíba	**21.6**	19.7 – 23.4	**21.3**	19.0 – 23.9	**29.8**	27.5 – 32.1
Pernambuco	**21.5**	19.7 – 23.4	**21.1**	19.2 – 23.2	**31.6**	29.5 – 33.8
Alagoas	**19.2**	17.1 – 21.3	**20.5**	18.4 – 22.6	**28.9**	26.6 – 31.3
Sergipe	**20.7**	18.6 – 22.8	**22.7**	20.5 – 25.1	**31.8**	29.5 – 34.2
Bahia	**20.0**	17.3 – 22.7	**23.5**	21.1 – 26.1	**30.3**	27.6 – 33.0
Minas Gerais	**24.0**	21.8 – 26.1	**24.8**	22.1 – 27.8	**36.0**	33.4 – 38.8
Espírito Santo	**20.6**	18.2 – 23.0	**22.0**	19.4 – 25.0	**31.6**	28.6 – 34.7
Rio de Janeiro	**23.9**	22.2 – 25.7	**27.5**	25.6 – 29.4	**37.8**	35.8 – 39.8
São Paulo	**23.0**	21.5 – 24.4	**24.3**	22.7 – 25.9	**34.8**	33.1 – 36.5
Paraná	**21.4**	19.2 – 23.7	**21.8**	19.4 – 24.3	**30.9**	28.6 – 33.4
Santa Catarina	**21.8**	18.6 – 24.9	**25.6**	22.3 – 29.2	**34.2**	31.0 – 37.5
Rio Grande do Sul	**24.9**	22.7 – 27.1	**27.6**	25.3 – 30.0	**39.3**	36.8 – 41.8
Mato Grosso do Sul	**21.1**	18.9 – 23.2	**26.3**	24.0 – 28.7	**35.0**	32.5 – 37.6
Mato Grosso	**20.8**	18.7 – 22.9	**18.2**	15.5 – 21.2	**27.8**	25.2 – 30.6
Goiás	**22.1**	19.9 – 24.4	**19.5**	17.6 – 21.6	**30.9**	28.6 – 33.3
Distrito Federal	**19.7**	17.6 – 21.8	**17.6**	15.6 – 19.7	**27.1**	24.9 – 29.4

BP: blood pressure; 95%CI: 95% confidence interval.

Table 3. Arterial hypertension and 95% confidence interval according to the criteria: self-reported blood pressure, measured blood pressure ≥ 140/90 mmHg; and blood pressure ≥ 140/90 mmHg or use of medications. Adult men, per state.

States	Self-reported BP		BP ≥ 140/90 mmHg measured		BP ≥ 140/90 mmHg measured and/or use of medications	
	%	95%CI	%	95%CI	%	95%CI
Rondônia	**15.9**	11.7 – 20.1	**17.2**	14.3 – 20.5	**23.1**	19.4 – 27.3
Acre	**12.6**	10.3 – 15.0	**18.7**	15.8 – 21.9	**23.4**	20.3 – 26.8
Amazonas	**11.7**	9.7 – 13.6	**15.1**	16.4 – 13.9	**18.4**	16.0 – 21.2
Roraima	**13.5**	10.4 – 16.5	**19.5**	16.8 – 22.6	**23.4**	20.6 – 26.6
Pará	**11.4**	8.4 – 14.4	**15.7**	12.7 – 19.3	**19.6**	16.3 – 23.5
Amapá	**10.6**	7.3 – 13.9	**17.6**	14.7 – 20.9	**20.3**	17.4 – 23.5
Tocantins	**16.9**	13.2 – 20.7	**16.8**	13.6 – 20.5	**25.3**	21.5 – 29.5
Maranhão	**9.3**	6.8 – 11.9	**19.9**	15.9 – 24.6	**23.1**	19.2 – 27.7
Piauí	**15.3**	12.1 – 18.5	**20.2**	16.9 – 24.0	**27.9**	24.4 – 31.6
Ceará	**16.1**	13.5 – 18.6	**23.9**	21.0 – 27.0	**30.6**	27.5 – 33.8
Rio Grande do Norte	**16.1**	12.8 – 19.5	**22.1**	18.6 – 26.1	**28.9**	25.2 – 32.9
Paraíba	**17.9**	14.9 – 20.9	**23.3**	19.8 – 27.3	**29.0**	25.5 – 32.9
Pernambuco	**18.0**	15.2 – 20.7	**23.9**	21.2 – 26.8	**31.8**	28.8 – 35.0
Alagoas	**15.8**	12.7 – 19.0	**22.8**	19.5 – 26.3	**28.6**	25.1 – 32.5
Sergipe	**15.1**	12.0 – 18.3	**25.7**	22.5 – 29.2	**32.0**	28.4 – 35.9
Bahia	**15.4**	11.2 – 19.7	**28.0**	23.7 – 32.6	**30.6**	26.3 – 35.3
Minas Gerais	**19.5**	17.0 – 22.1	**29.1**	24.8 – 33.7	**37.0**	33.1 – 41.1
Espírito Santo	**16.4**	13.1 – 19.7	**23.4**	19.0 – 28.6	**30.2**	25.7 – 35.2
Rio de Janeiro	**21.1**	18.4 – 23.7	**30.7**	27.8 – 33.8	**39.2**	36.1 – 42.3
São Paulo	**20.8**	18.7 – 22.9	**27.6**	25.2 – 30.2	**36.5**	34.0 – 39.2
Paraná	**19.8**	16.4 – 23.2	**23.2**	20.2 – 26.5	**31.4**	28.1 – 35.0
Santa Catarina	**18.4**	14.5 – 22.4	**26.1**	21.5 – 31.3	**33.9**	29.6 – 38.6
Rio Grande do Sul	**21.5**	18.7 – 24.4	**31.8**	28.3 – 35.5	**40.8**	37.2 – 44.4
Mato Grosso do Sul	**17.4**	14.5 – 20.2	**29.9**	26.2 – 33.9	**36.5**	32.6 – 40.6
Mato Grosso	**17.6**	14.3 – 20.9	**21.3**	17.3 – 25.9	**28.5**	24.5 – 32.9
Goiás	**19.8**	16.6 – 23.0	**21.9**	19.2 – 25.0	**30.8**	27.3 – 34.6
Distrito Federal	**17.1**	14.2 – 20.0	**20.2**	17.0 – 23.7	**26.9**	23.6 – 30.4

BP: blood pressure; 95%CI: 95% confidence interval.

Table 4. Arterial hypertension and 95% confidence interval according to the criteria: self-reported blood pressure; measured blood pressure ≥ 140/90 mmHg; and blood pressure ≥ 140/90 mmHg or use of medications. Adult women, per state.

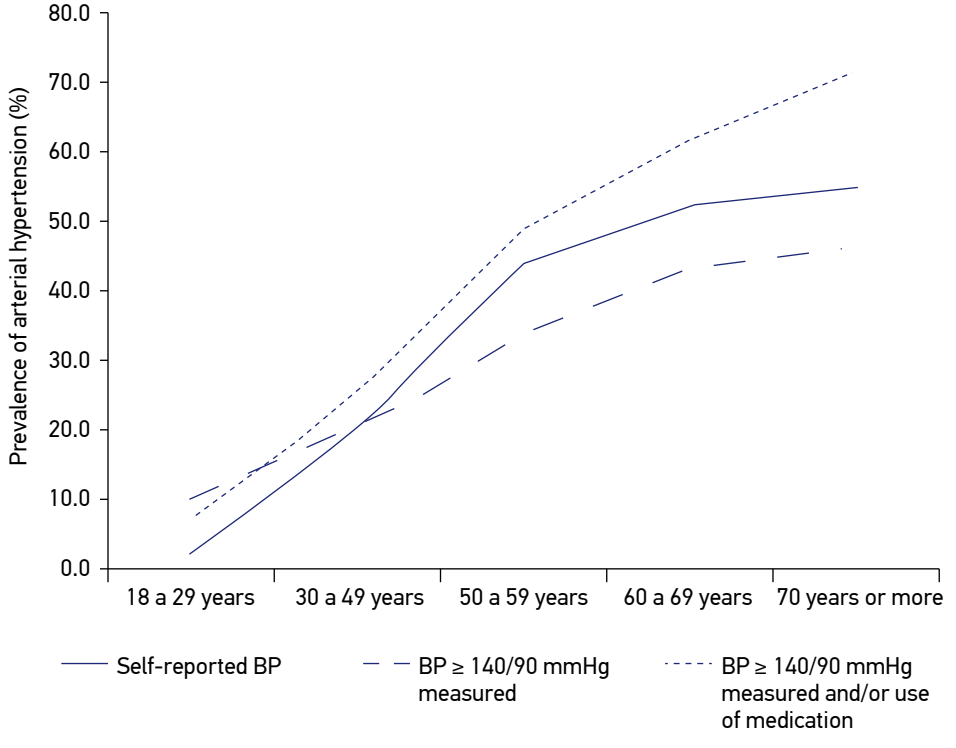
States	Self-reported BP		BP ≥ 140/90 mmHg measured		PA ≥ 140/90 mmHg measured and/or use of medications	
	%	95%CI	%	95%CI	%	95%CI
Rondônia	**20.3**	17.1 – 23.5	**14.0**	12.1 – 16.2	**24.2**	21.3 – 27.5
Acre	**19.3**	16.8 – 21.8	**12.8**	10.8 – 15.1	**22.2**	19.7 – 24.8
Amazonas	**15.7**	13.5 – 17.9	**10.2**	8.3 – 12.6	**17.1**	14.9 – 19.6
Roraima	**14.9**	12.4 – 17.4	**11.0**	8.9 – 13.5	**19.4**	17.0 – 22.0
Pará	**14.8**	12.1 – 17.5	**13.4**	10.8 – 16.5	**19.8**	16.8 – 23.2
Amapá	**15.7**	12.9 – 18.4	**15.3**	12.4 – 18.9	**20.4**	17.1 – 24.1
Tocantins	**22.0**	19.0 – 25.1	**12.6**	9.9 – 16.0	**26.1**	22.7 – 29.8
Maranhão	**17.6**	14.1 – 21.1	**14.6**	11.3 – 18.8	**24.1**	21.1 – 27.4
Piauí	**23.0**	20.1 – 25.8	**16.4**	13.5 – 19.8	**27.8**	24.7 – 31.1
Ceará	**21.1**	18.5 – 23.7	**17.3**	15.1 – 19.8	**27.9**	25.3 – 30.7
Rio Grande do Norte	**24.9**	22.3 – 27.5	**16.5**	13.6 – 19.9	**31.5**	28.4 – 34.8
Paraíba	**24.8**	22.2 – 27.3	**19.5**	16.3 – 23.1	**30.4**	27.4 – 33.5
Pernambuco	**24.6**	22.2 – 27.0	**18.7**	16.4 – 21.1	**31.4**	29.0 – 34.0
Alagoas	**22.1**	19.2 – 25.0	**18.4**	15.7 – 21.5	**29.1**	25.9 – 32.5
Sergipe	**25.9**	23.0 – 28.8	**19.9**	17.3 – 22.9	**31.6**	28.9 – 34.5
Bahia	**24.0**	20.7 – 27.3	**19.6**	17.1 – 22.4	**29.9**	27.3 – 32.8
Minas Gerais	**28.0**	24.8 – 31.1	**21.0**	18.0 – 24.3	**35.1**	31.9 – 38.5
Espírito Santo	**24.4**	20.9 – 28.0	**20.8**	18.1 – 23.8	**32.9**	29.5 – 36.4
Rio de Janeiro	**26.3**	24.2 – 28.4	**24.8**	22.8 – 27.0	**36.6**	34.5 – 38.8
São Paulo	**24.8**	22.8 – 26.9	**21.3**	19.3 – 23.4	**33.2**	31.0 – 35.6
Paraná	**22.9**	20.0 – 25.8	**20.4**	17.7 – 23.5	**30.5**	27.6 – 33.5
Santa Catarina	**25.0**	20.2 – 29.8	**25.1**	20.7 – 30.1	**34.4**	29.9 – 39.3
Rio Grande do Sul	**27.9**	24.8 – 30.9	23.8	21.2 – 26.5	**37.9**	34.5 – 41.4
Mato Grosso do Sul	**24.4**	21.6 – 27.3	**22.9**	20.3 – 25.7	**33.7**	30.7 – 36.8
Mato Grosso	**24.0**	20.7 – 27.2	**15.1**	12.0 – 18.9	**27.1**	23.5 – 31.0
Goiás	**24.3**	21.6 – 27.0	**17.2**	14.5 – 20.2	**31.0**	28.3 – 33.8
Distrito Federal	**21.9**	19.2 – 24.6	**15.4**	12.9 – 18.1	**27.3**	24.6 – 30.2

PA: pressão arterial; IC95%: intervalo de confiança de 95%.

significant. There were no differences regarding urban and rural, except for measured AH, which was lower in rural, among female participants. In general, the prevalence rates of AH considering all of the criteria were higher in the Southeast and South regions, and in the states of these regions.

The treatment of hypertension has been associated with about 40% of reduction of stroke, and about 15% of reduction in acute myocardial infarction; that is why the WHO[20] recommends the early diagnosis and the population monitoring of AH[16,20]. The NHS innovates because it allows the use of different diagnostic criteria to estimate the prevalence of high BP[14]. We used digital electronic devices, allowing to establish the gold-standard in relation to the population diagnosis of hypertension, constituting something new in the country[9,14]. The BP measurement is recommended internationally, for being the most reliable criterion and for enabling the standardization of the results[20-22].

The questionnaires containing self-reported measurements have been widely used, in other countries and in Brazil, for having low cost and being easy to execute[8,22]. A population study in a cohort of elderly people, in Bambuí, Minas Gerais, carried out the validation between referred and measured measurements, and the results found were valid, indicating that self-reported AH can be used as a valid population estimation[13]. A study carried out by Universidade



BP: blood pressure.

Figure 1. Population prevalence of high blood pressure according to different diagnostic criteria, in adults aged 18 years or more, of both genders, according to age group, Brazil, 2013.

Federal de Pelotas, aiming at validating the self-report of AH in a population-based study, has also shown that this methodology is valid and can be used in our field to monitor changes in the prevalence of NCCD[23]. The NHS found close results between the self-reported and measured measurements, which may indicate that the self-reported measurement can be useful in population studies. The fact that only 3% of the Brazilian population declared never having measured BP in the country[24] was considered as a factor that facilitates the adoption of referred measures, as a proxy of the population prevalence rates.

The differences according to sex are also in agreement with the literature. In general, the self-reported criterion tends to increase the diagnosis among women, as already identified[8,11,24]. One of the explanations can be the fact that women attend health services more often, which leads to more opportunities of diagnosis, also identified in the NHS[11,25]. Among studies with diagnostic criterion of measured AH, on the contrary, men presented with higher prevalence rates. This has been described in study by the WHO, which estimated, globally, higher prevalence rates among men (29.2%), and 24.8% among women[26]. The same was true for the region of the Americas: 26.3% for male and 19.7% for female individuals[26]; and in Brazil: 25.8% for male versus 20.0% for female individuals[9].

The study also identified the increasing prevalence of hypertension with age, which is in agreement with the literature and is explained by the physiological changes of aging, with stiffening of blood vessels, more peripheral vascular resistance and comorbidity among the elderly[27-29].

The regional differences with higher prevalence in the federative units of the Southeast and South can be explained by demographic factors, such as higher life expectancy and differences in the age structure of these regions, with more participation of the elderly[30]. Other studies have also identified higher prevalence rates of hypertension in states like Rio de Janeiro, São Paulo and Rio Grande do Sul[9,18,31].

The NHS identified that, among the adults who reported AH (21.4%), 81.4% mentioned having taken medication, and 69.7% of the adults with self-reported AH received medical care in the past 12 months[24]. Therefore, using the criterion of having high blood pressure or taking medication led the prevalence rate to reach more than one third of the adult population, reaching more than 70% of the population aged more than 70 years. The wide access to medication for hypertension and diabetes in the Unified Health System (SUS) stands out, as well as the gratuity programs, such as "Aqui tem Farmácia Popular" [24,32].

The approval of the Global Plan to Face the chronic NCD, in the World Health Assembly, defined a set of global goals for the reduction of the chronic NCD and their risk factors. Among them is the relative reduction of the prevalence of high BP in 25%, among people aged 18 years or more (defined as BP ≥ 140 mmHg/≥ 90 mmHg) and, in some contexts, according to national circumstances, there is a goal of restricting the growth of AH[16]. Therefore, it is important to monitor these indicators, since countries will have to periodically report their results to the WHO, aiming at the evaluation of the goal in 2025[16]. The goal adopted by the WHO explains the criterion of measured AH as the international reference standard, showing the importance of the NHS having verified that measurement, enabling an international comparison[16].

The global indicator of reduction in 25% of the AH[16] is not a consensus in the literature, especially regarding the institution of a drug treatment for all hypertensive individuals[33,34].

Beaglehole et al.[35] defend that reduced levels of BP in the population will be reached faster with population measures, such as the reduction in the consumption of salt, the stimulus to physical activities and healthy diets. The drug treatment would be prioritized for people with high global risk of cardiovascular disease[35]. However, MacMahon et al.[36] defend that the control of AH in the United States, in the past decades, was owed to the increasing availability of the drug treatment. Another argument that is contrary to the population mass treatment would be the size of the cost and effort, which, in the case of Brazil, would include one third of the adults, according to a current study[34,35]. In the case of China, treating the entire population with levels of BP > 140/90 mmHg with medication could cost about one tenth of the health budget of the country[35]. Beaglehole et al.[35] state that not always the population with BP levels > 140/90 mmHg would present with risks of cardiovascular diseases, since half of all cardiovascular conditions affects non-hypertensive people[36]. Therefore, hypertensive people who also have cardiovascular risk should be prioritized for the drug treatment[35].

Among the limitations, this is an epidemiological study, using data from the NHS, which uses a standardized technique for measured BP by trained interviewers, who are not health professionals, so there could be errors in measurement[37]. Besides, the literature describes that the measurements of BP may range due to different techniques used, and the anxiety for measuring BP, possibly resulting in a sudden rise[38]. Probably, this must have been a minimum fact, since the procedure was performed by non-physicians, in the household of the participants. Regarding the previous diagnosis and the use of medication, for being information that was self-reported by the interviewees, there may have been differences in the understanding of the interviewees, memory bias, among others. These factors may affect the prevalence rates described here. It is also worth noting that the criterion AH measured by instrument is related to high BP at the time of measurement, which differs somewhat from arterial hypertension, which is defined as presenting this measure systematically.

CONCLUSION

The matter of chronic NCD became a priority in global agendas. However, there are still many challenges, such as the monitoring of the chronic NCD through valid methodologies, that are easy to measure and have low cost, elucidating a reliable population diagnosis for the development of effective policies. The current study presents three different valid diagnostic criteria to measure the prevalence of population AH. Self-reported and measured AH presented close prevalence rates, confirming that the self-reported measurement is useful in population studies. However, the monitoring of global goals of AH reduction[16] will be carried out using measured measurements, showing the right choice of the NHS to include the BP measurement in its scope. The measured AH criterion and/or use of anti-hypertensive medications included a high number of individuals with AH, pointing to the challenge of supply and cost of anti-hypertensive drugs for almost one third of the Brazilian population.

Knowing and monitoring indicators referring to chronic NCD, including the goals of AH reduction, is important in a national and global context. The NHS constitutes the baseline

for the indicator of measured hypertension reduction. To reach the goal of relative reduction of 25% in the prevalence of high blood pressure it will be necessary to intervene for the reduction of the intake of salt, saturated fats and for the increasing intake of vegetables and fruits; efforts to reduce overweight/obesity and screening for the detection and early treatment of hypertensive individuals. The current study can support this AH monitoring and identify priorities for action.

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