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Prevalence, awareness, treatment and control of hypertension in the Brazilian population and sociodemographic associated factors: data from National Health Survey

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Abstract

Background Hypertension is the main risk factor for cardiovascular diseases and more recent studies that estimated the prevalence of this condition considering aspects such as awareness of diagnosis, treatment, and control, revealing alarming results in the global scenario.

Objective To estimate the prevalence and assess the factors associated with hypertension prevalence, awareness, treatment, and control.

Methods This is a cross-sectional study based on data from the 2013 National Health Survey in Brazil. A total of 59,226 individuals of both sexes took part in this study. Exposure were defined based on blood pressure measurements, self-reported diagnosis of hypertension and use of antihypertensive medication. We estimated the prevalence of the dependent variables and the associations were subsequently tested by calculating prevalence ratios using Poisson regression.

Results The study population was composed mostly of women (52.3%), aged 36 to 59 years (42.6%), of white race/color (47.5%), with low schooling between 0 and 8 years (49.1%), having a partner (55.7%), in the urban area of the country (86.2%), mainly in the Southeast region (43.9%) and without health insurance (69.7%). The prevalence of hypertension in the Brazilian population was 32.3%. 60.8% were aware of the diagnosis, 90.6% were taking medication treatment and, of these, 54.4% had controlled blood pressure. Female gender and older age were associated with greater awareness (PR 1,34; 95% CI 1,28 – 1,40 / PR 2,40; 95% CI 2,15 – 2,69; respectively), treatment (PR 1,10; 95% CI 1,07 – 1,12 / PR 1,25; 95% CI 1,17 – 1,35; respectively) and control (PR 1,10; 95% CI 1,02 – 1,17 / PR 0,83; 95% CI 0,73 – 0,96; respectively). Other factors such as having a partner, health insurance, living in the urban area, race/color and schooling were also associated with dependent variables.

Conclusion This study reveals that although a high percentage of hypertensive patients are taking medication, there are still substantial gaps in awareness and control, particularly among certain sociodemographic groups. Men, those

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with less schooling, black and brown people, those living in rural areas and those without health insurance have lower levels of awareness and control of hypertension.

Keywords Hypertension, Awareness, Cross-sectional studies, Health knowledge, Socioeconomic factors

Background

Arterial Hypertension (hypertension) is the main risk factor for cardiovascular diseases, contributing to the increase of early deaths and disabilities in the world and Brazilian population [1, 2]. In Brazil, from 1990 to 2017 there was a 53.4% increase in the number of deaths attributed to hypertension, highlighting it as the main risk factor for overall mortality [3]. Estimates of hypertension prevalence in the Brazilian population range from 18.9 to 32.3% according to age, diagnostic criteria and geographic region [3–5].

Despite consolidated evidence on treatment and control through changes in diet, lifestyle and low-cost medications, a large contingent of hypertensive patients persist without diagnosis and control of blood pressure levels [6]. Thus, one of the goals present in the United Nations Sustainable Development Goals to be achieved by 2030 concerns universal health coverage and access [7], such as the management of risk factors and Chronic Noncommunicable Diseases (NCDs), which has been used as an important performance measure for this achievement [8, 9]. Of a total of 1.39 billion people with hypertension worldwide, 75% live in low- and middle-income countries and only one in three have their blood pressure treated with antihypertensives and one in seven have their pressure adequately controlled [10–14].

A review conducted in Brazil with data published between 1995 and 2009 showed that the prevalence of awareness of hypertension ranged from 22 to 77%, treatment from 11.4% to 77.5% and control from 10.1% to 35.5% [15]. A study conducted with the Brazilian elderly population showed a prevalence of control of 34.7%, and the lowest prevalence of adequate management were in groups of low socioeconomic status, in black and brown skin color and among those without health insurance [16]. However, these results were estimated in studies restricted to specific populations, and their generalizability is limited [15–17].

Given the importance of hypertension as a public health concern, dimensioning awareness, treatment and control of this condition according to sociodemographic characteristics in the Brazilian context marked by social and racial inequalities becomes a challenge [18]. Using data from the Brazilian National Health Survey, the aim of this study was to estimate the prevalence of awareness, treatment and control of hypertension in the Brazilian adult population. Additionally, we examined the sociodemographic factors associated with these dependent variables.

Methods

Study population

It was a cross-sectional study using data from National Health Survey (PNS) which is a representative household survey for Brazil of the adult population (18 years and older). The first edition of this survey was conducted in August 2013 to February 2014, by the Health Surveillance Department of the Ministry of Health in partnership with Oswaldo Cruz Foundation and the Brazilian Institute of Geography and Statistics (IBGE) [19–21].

The sampling plan used in the PNS was three-stage cluster sampling [21]. In the first stage, census tracts were randomly selected from the Primary Sampling Units defined in the IBGE master sample. In the second stage, a fixed number of private households were selected and, in the third, in each selected household, a resident aged 18 or over was chosen to answer the individual interview [21].

For the final survey sample, there was a loss rate of 20.8% and a non-response rate of 8.1% [19–21]. The survey visited a total of 69.994 households, resulting in 64.348 household interviews and 60.202 individual interviews with the selected residents [19–21]. Further details on the PNS sampling methodology are available in previous publications [19–21]. For this study, we excluded pregnant women ($n=800$) and those uncertain of their pregnancy status at the time of the interview ($n=176$). This yielded a final study sample of 59.226 individuals (Fig. 1).

Data collection

The interview was conducted using a household questionnaire and individual questions related to socioeconomic and health status [19, 21]. In addition, weight, height, waist circumference and blood pressure measurements were performed in the randomly selected resident aged 18 years or older [20]. Three blood pressure (BP) measurements were taken using a validated oscillometric device on the right arm after a 5-min rest in a sitting position, with one-minute intervals between each measurement. The mean of the last two readings for SBP and DBP was calculated and used for analysis, following the procedures outlined in the Anthropometry Manual of the National Health Survey [22].

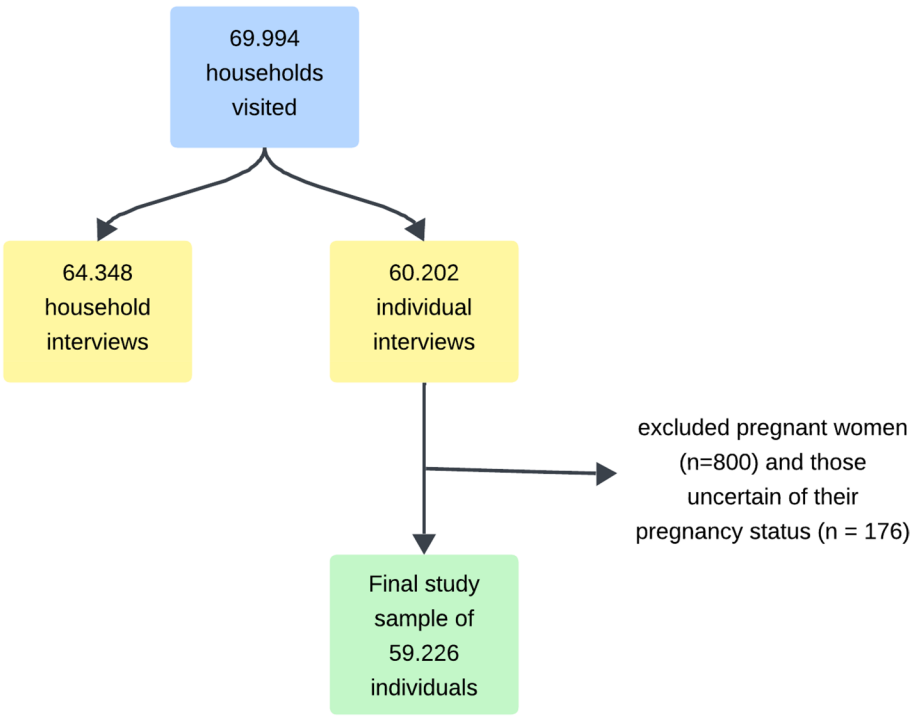

Fig. 1 Study population

Study variables

Hypertension was defined as a systolic blood pressure (SBP) ≥ 140 mmHg or a diastolic blood pressure (DBP) ≥ 90 mmHg based on measured readings, or self-reported use of antihypertensive medication, assessed by the question: 'In the last two weeks, have you taken medication for hypertension (high blood pressure)? "Participants classified as hypertensive who responded positively to the question *"Has a doctor ever given you a diagnosis of hypertension (high blood pressure)?"* were considered to be aware of the diagnosis.

Hypertensive participants who were aware of their diagnosis and who reported using antihypertensive medication by asking the question: *"In the last two weeks, have you taken medication because of hypertension (high blood pressure)?"* were considered as treated. Hypertensive participants on treatment were considered to have hypertension control if their casual SBP was < 140 mmHg and casual DBP < 90 mmHg. Figure 2 shows how the prevalence of awareness, treatment and control of hypertension were calculated.

Independent variables

Sociodemographic characteristics were used, all self-reported, as follows: sex (male and female), age group (18 to 35, 36 to 59 and 60 years or older), race/color (white, brown, black and yellow/indigenous), schooling (below 8 years, 9 to 11 and 12 years or more), marital status, classified as having a partner (married) and without a partner (single, divorced, separated, widowed), area of residence (urban and rural) and region (southeast, central-west, north, northeast and south), and health insurance (yes or no).

Statistics analysis

We estimated the prevalence of hypertension awareness, treatment and control according to the sociodemographic characteristics of the individuals. For all estimates, 95% confidence intervals (95%CI) were calculated.

We used Poisson regression models to analyze the factors associated with awareness, treatment and control, obtaining estimates of prevalence ratios (PR). To facilitate the interpretation of the regression models results, we also estimated the predicted probabilities and 95%CI for each dependent variable according to the sociodemographic variables. We used Stata 14.0 software *(Stata Corp., College Station, TX, USA)* in the *survey* module to obtain population estimates. In the *survey module* it is possible to consider the complex structure of the sample of strata, clusters and individual weights of the PNS, in addition to the use of analytical subpopulations [23].

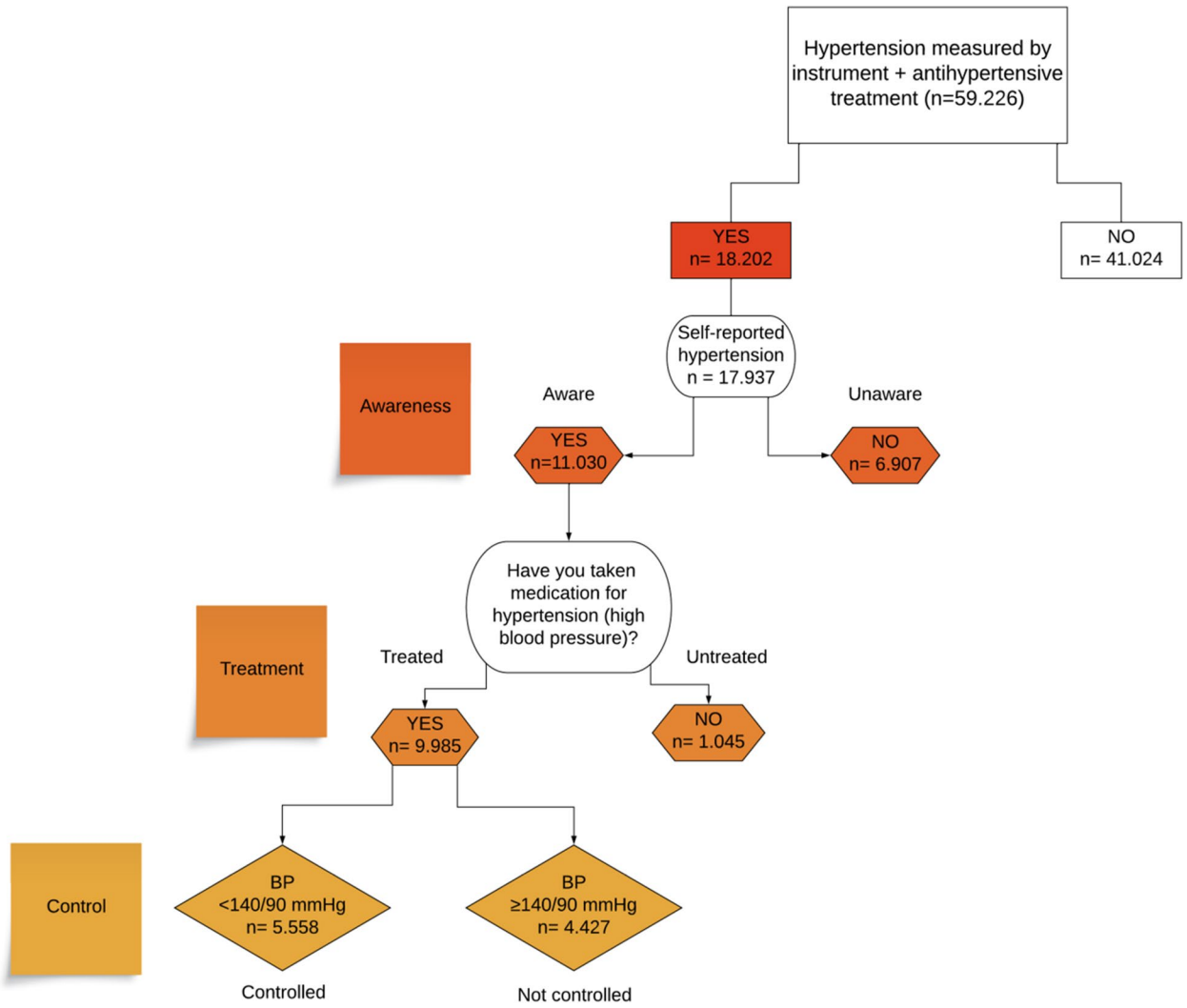

Fig. 2 Hypertension management sequence in 2013, Brazil

Ethical aspects

This study used a secondary database with public access, guaranteeing participants confidentiality and requiring prior approval by the Research Ethics Committee. PNS data were collected by IBGE and are available online (https://www.ibge.gov.br/estatisticas/sociais/saude/9160-pesquisa-nacional-de-saude.html?=&t=microdados). Even so, it is noteworthy that the PNS was approved by the National Research Ethics Committee with the respective opinion: CAAE n° 10853812.7.0000.0008 and complies with all ethical precepts, in accordance with the recommendations for research with human beings of Resolution 466/12 (No. 328159, June 26th, 2013), and all participants signed a free and informed consent at interview.

Results

The study population comprised women (52.3%; 95% CI 51,5 – 53,0), aged 36 to 59 years (42.6%, 95% CI 41,9 – 43,3), of white race/color (47.5%; 95% CI 46,7 – 48,3), with low schooling (below 8 years) (49.1%; 95% CI 48,4 – 50,0), having a partner (55.7%; 95% CI 54,9 – 56,5), residing in urban areas of the country (86.2%; 95% CI 85,8 – 86,7), concentrated in the Southeast region (43.9%; 95% CI 43,3 – 44,6), and without health insurance (69.7%; 95% CI 68,8 – 70,7) (Table 1). Table 1 also shows an estimated prevalence of hypertension of 32.3% (95% CI 31.7–33.1) in the Brazilian population and it's sociodemographics associations.

We estimated that 60.8% (95%CI 59.5—62.1) of individuals were aware of their hypertension. It was

Table 1 Sociodemographic characteristics of the study population ($n = 59,226$) and prevalence of hypertension according to sociodemographic characteristics. PNS, Brazil, 2013

Sociodemographic characteristics	Total		Hypertension	
	%	95%CI	%	95%CI
Total	100	-	32.3	(31.7—33.1)
Sex				
Male	47.7	46.9—48.5	33.0	(31.9—34.1)
Female	52.3	51.5—53.0	31.8	(30.9—32.7)
Age group				
18 to 35 years	39.1	38.4—39.9	11.3	(10.5—12.1)
36 to 59 years	42.6	41.9—43.3	37.4	(36.2—38.5)
60 years and over	18.3	17.7—18.9	66.1	(64.5—67.6)
Race/Color				
White	47.5	46.7—48.3	33.5	(32.4—34.6)
Brown	41.9	41.2—42.7	30.3	(29.3—31.3)
Black	09.2	08.8—09.7	36.6	(34.4—38.7)
Yellow/Indigenous	01.4	01.2—01.5	30.1	(24.9—35.8)
Schooling (in years)				
Below 8 years	49.1	48.2—50.0	42.2	(41.2—43.3)
9 to 11	33.4	32.7—34.2	22.3	(21.2—23.5)
12 and over	17.5	16.7—18.3	23.9	(22.4—25.6)
Marital status				
Having a partner	55.7	54.9—56.5	27.7	(26.8—28.6)
Without a partner	44.3	43.5—45.1	38.3	(37.2—39.4)
Housing Area				
Rural	13.8	13.3—14.2	33.1	(31.6—34.7)
Urban	86.2	85.8—86.7	32.3	(31.4—33.1)
Health insurance				
No	69.7	68.8—70.7	32.6	(31.8—33.5)
Yes	30.3	29.3—31.2	31.8	(30.5—33.1)
Region				
South East	43.9	43.3—44.6	35.6	(34.2—36.9)
South	14.7	14.3—15.1	35.1	(33.4—36.9)
Center-West	07.4	07.2—07.6	30.3	(28.8—31.8)
North	07.4	07.2—07.6	20.6	(19.3—21.9)
North East	26.6	26.1—27.2	29.4	(28.2—30.7)

95% CI 95% Confidence Interval; *$p < 0.05$ by Chi-square test

observed that males (50.5%; 95%CI 48.5—52.5), aged 18 to 35 years (28.3%; 95%CI 25.2—31.5), having a partner (56.6%; 95%CI 54.8—58.5), in the rural area of the country (54.9%; 95%CI 52.1—57.8), and without health insurance (58.9%; 95%CI 57.3—60.4) had lower prevalence of awareness (Table 2). The variables sex, age, education, marital status, area of residence and health insurance were associated with the hypertension awareness in the final adjusted model. There was a high association between the variables health insurance and schooling. For this reason, these variables were not included simultaneously in the final model.

The prevalence of individuals on medications treatment was 90.6% (95%CI 89.5–91.6) (Table 2). Males (85.9%; 95%CI 83.8–87.7) and individuals aged 18–35 years (74.4%; 95%CI 68.5–79.5) had a lower prevalence of hypertension treatment (Table 2). Sex, age group, having a partner and race/color were associated with hypertension treatment in the final adjusted model (Table 2).

Table 2 also shows the prevalence of hypertension treated patients who are under control 54.4% (95%CI 52.6–56.2). When prevalence rates were estimated by sociodemographic characteristics, individuals with low schooling (51.7%; 95%CI 49.5–53.8) and without health insurance (52.0%; 95%CI 49.9–54.2) had lower prevalence of hypertension control. Women showed significantly higher awareness of hypertension compared to men, with an adjusted PR of 1.34 (95% CI: 1.28—1.40). Awareness also increased with age: individuals aged 36–59 had an adjusted PR of 1.96 (95% CI: 1.75—2.20) compared to the 18–35 age group, those 60 and older had an adjusted PR of 2.40 (95% CI: 2.15—2.69).The prevalence of receiving treatment was also higher for women (PR = 1.10, 95% CI: 1.07—1.12) and increased with age, with those aged 60 and over showing an adjusted PR of 1.25 (95% CI: 1.17—1.35) compared to the youngest age group. Control prevalences were higher in individuals with higher education, with those who completed 12 or more years of schooling having an adjusted PR of 1.17 (95% CI: 1.06—1.28) compared to those with below 8 years of schooling. Control prevalences also varied by race/color, with black participants showing lower control (PR = 0.81, 95% CI: 0.70—0.93) compared to white participants. The predicted probabilities of awareness, treatment and control according to selected variables are shown in Fig. 3.

Discussion

This study provides a comprehensive overview of hypertension prevalence, awareness, treatment, and control and factors associated among the Brazilian adult population, using data from National Health Survey. Among adults with hypertension, the prevalence of awareness was 60.8%. We found that awareness was significantly higher among those aged over 60, females, urban residents, and participants with health insurance in the fully adjusted models. The current use of medication to lower blood pressure showed a similar trend among females, those aged over 36, and participants without partners. Hypertensive participants identifying as brown had a significantly lower prevalence of medication use compared to white adults. Among adults with hypertension, females, those with more than nine years of schooling, and residents of the South region were more likely to

Table 2 Prevalence of awareness, treatment and control of hypertension in the Brazilian adult population according to sociodemographic variables. PNS, Brazil, 2013

Features sociodemographic	Awareness		Adjusted PR		Treatment		Adjusted PR		Control		Adjusted PR	
	%	(95%CI)	PR	(95%CI)	%	(95%CI)	PR	(95%CI)	%	(95%CI)	PR	(95%CI)
Total	60.8	(59.5—62.1)	-	-	90.6	(89.5—91.6)	-	-	54.4	(52.6—56.2)	-	0
Sex												
Male	**50.5**	**(48.5—52.5)***	Ref		**85.9**	**(83.8—87.7)***	Ref		**51.8**	**(48.8—54.9)***	Ref	
Female	**70.5**	**(68.9—71.9)***	**1.34**	**(1.28—1.40)***	**93.7**	**(92.7—94.6)***	**1.10**	**(1.07—1.12)***	**55.9**	**(53.8—58.1)***	**1.10**	**(1.02—1.17)***
Age group												
18 to 35 years	**28.3**	**(25.2—31.5)***	Ref		**74.4**	**(68.5—79.5)***	Ref		**63.1**	**(54.6—70.8)***	Ref	
36 to 59 years	**59.6**	**(57.8—61.4)***	**1.96**	**(1.75—2.20)***	**88.5**	**(86.7—90.0)***	**1.17**	**(1.09—1.26)***	**56.5**	**(53.8—59.1)***	0.89	(0.78—1.01)
60 years and over	**73.9**	**(71.9—75.7)***	**2.40**	**(2.15—2.69)***	**94.9**	**(93.8—95.9)***	**1.25**	**(1.17—1.35)***	**51.4**	**(48.9—53.9)***	**0.83**	**(0.73—0.96)***
Race/Color												
White	61.6	(59.6—63.5)	-	-	**92.5**	**(91.2—93.7)***	Ref		**56.7**	**(53.9—59.4)***	Ref	
Brown	60.1	(58.2—61.9)	-	-	**88.4**	**(86.3—90.2)***	**0.97**	**(0.94—0.99)***	**53.5**	**(50.9—56.1)***	**0.93**	**(0.86—0.99)***
Black	60.5	(56.3—64.5)	-	-	**89.3**	**(85.9—91.9)***	0.98	(0.94—1.01)	**46.4**	**(40.5—52.4)***	**0.81**	**(0.70—0.93)***
Yellow/Indigenous	55.4	(44.2—66.1)	-	-	**92.2**	**(86.0—95.8)***	1.00	(0.94—1.06)	**52.9**	**(39.4—66.1)***	0.90	(0.69—1.17)
Schooling (in years)												
Below 8	**64.1**	**(62.5—65.7)***	-	-	91.1	(89.8—92.2)	-	-	**51.7**	**(49.5—53.8)***	Ref	
9 to 11	**52.7**	**(49.9—55.4)***	-	-	89.5	(86.8—91.7)	-	-	**58.7**	**(55.0—62.3)***	**1.09**	**(1.01—1.18)***
12 and over	**59.1**	**(55.1—62.9)***	-	-	89.8	(86.2—92.6)	-	-	**62.4**	**(57.0—67.5)***	**1.17**	**(1.06—1.28)***
Marital status												
Having a partner	**56.6**	**(54.8—58.5)***	Ref		**89.1**	**(87.7—90.5)***	Ref		53.6	(51.3—55.9)	-	-
Without a partner	**64.6**	**(62.9—66.2)***	**1.11**	**(1.06—1.15)***	**91.7**	**(90.2—93.0)***	**1.04**	**(1.02—1.06)***	54.9	(52.3—57.6)	-	-
Housing Area												
Rural	**54.9**	**(52.1—57.8)***	Ref		88.9	(86.4—91.1)	Ref		**50.0**	**(46.0—54.1)***	Ref	
Urban	**61.8**	**(60.3—63.2)***	**1.10**	**(1.04—1.16)***	90.8	(89.6—91.9)	1.01	(0.98—1.04)	**54.9**	**(52.9—56.9)***	1.06	(0.96—1.15)
Health insurance												
No	**58.9**	**(57.3—60.4)***	Ref		**89.7**	**(88.4—90.8)***	Ref		**52.0**	**(49.9—54.2)***	-	-
Yes	**65.4**	**(63.1—67.7)***	**1.07**	**(1.03—1.12)***	**92.4**	**(90.3—94.1)***	1.02	(0.99—1.04)	**59.2**	**(55.9—62.5)***	-	-
Region												
South East	60.8	(58.6—62.9)	-	-	91.4	(89.6—92.9)	Ref		54.2	(51.1—57.3)	Ref	
South	61.9	(58.7—65.0)	-	-	90.2	(87.5—92.4)	0.99	(0.96—1.02)	51.8	(47.9—55.6)	0.95	(0.86—1.04)
Center-West	62.8	(60.1—65.5)	-	-	91.6	(89.6—93.3)	1.02	(0.99—1.04)	59.4	(55.7—63.0)	**1.10**	**(1.02—1.20)***
North	59.9	(56.2—63.5)	-	-	89.9	(87.1—92.2)	1.00	(0.97—1.04)	56.4	(51.4—61.2)	1.08	(0.97—1.19)
North East	59.8	(57.5—61.9)	-	-	88.4	(86.8—90.8)	0.99	(0.96—1.01)	54.6	(51.6—57.6)	1.04	(0.96—1.13)

95%CI 95% Confidence Interval, *HYPERTENSION* Arterial Hypertension, *PR* prevalence ratio; *$p < 0.05$

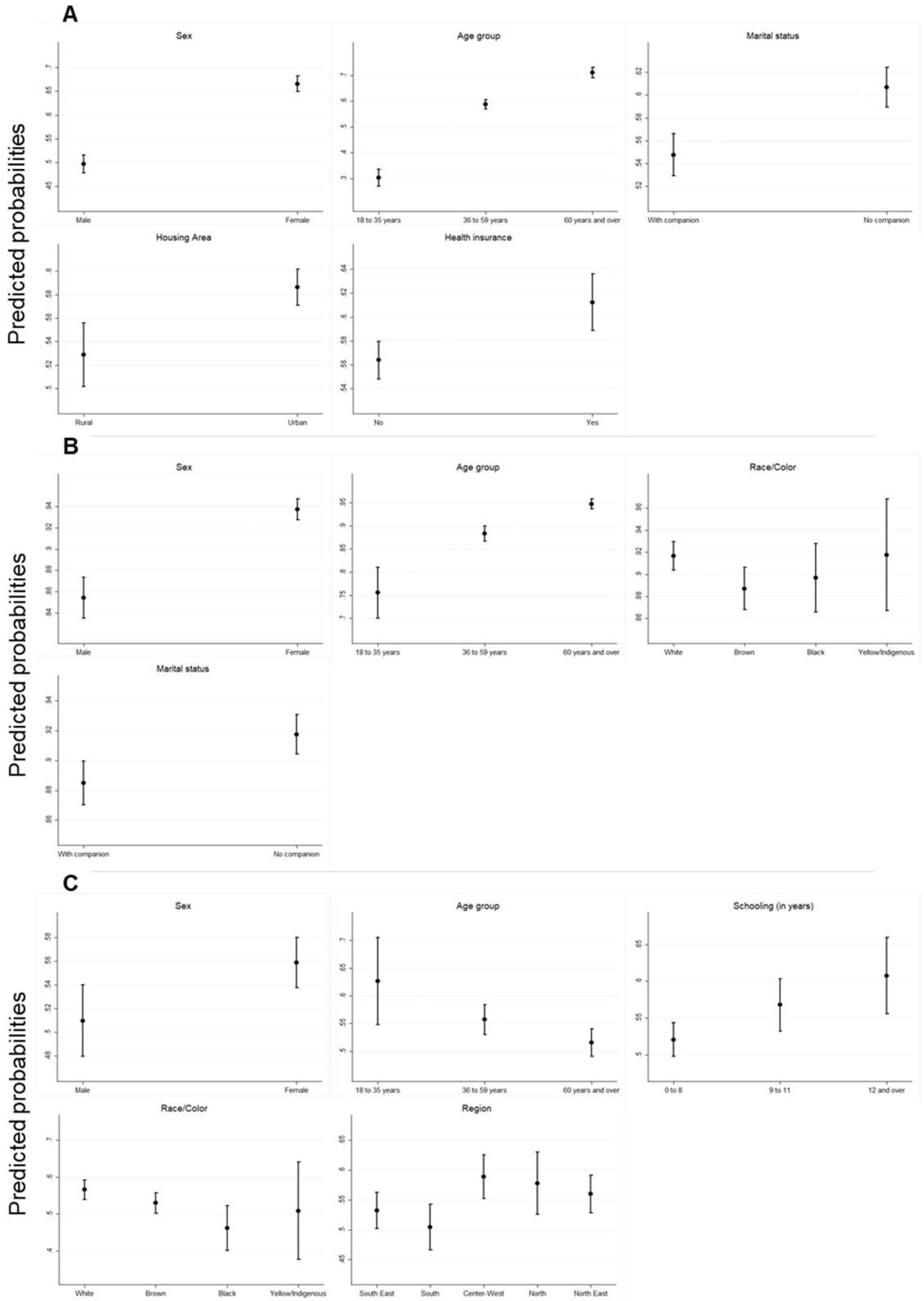

Fig. 3 Predicted probabilities of awareness, treatment and control of hypertension. Brazil, 2013. Legend to Fig. 2: (**2A**) Awareness of hypertension diagnosis according to sex, age group, marital status, area of residence and health insurance plan, (**2B**) Hypertension treatment according to sex, age group, race/color and marital status and (**2C**) Hypertension control according to sex, age group, education, race/color and region

have controlled hypertension. Conversely, hypertensive adults aged over 60 and participants identifying as black or brown were less likely to have controlled hypertension.

All of prevalence ratios were estimated accurately, considering the complex survey by using Poisson regression fully adjusted. In general, the health service delivery system in Brazil demonstrates limited effectiveness in managing hypertension, with significant gaps in diagnosis, awareness, and treatment adherence.

A systematic review of with data from low- and middle-income countries (regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia, and sub-Saharan Africa) the rate of hypertension control was 30% [10], figures lower than those presented in this study. The prevalence of control in Brazil was similar to that estimated in high-income countries, higth 50.4% [10] and 39% [13]. However, some of these a Canada, German and South Korea countries have already shown better hypertension control rates (70%) [13]. Thus, in more developed countries a Canada, the USA, South Korea, and Germany, national hypertension screening programmes use health check-ups, the implementation of regular blood pressure measurements, recording and feedback [13]. These actions probably explain the better prevalence of successful control in these countries.

The high prevalence of hypertension treament shown in this study can be explained by policy and programmatic factors. Access to treatment depends on availability, price and distance to dispensing services [24, 25]. In one of the richest states in Brazil, a study showed that there are sufficient resources and dispensing of medications, so there are no barriers to the provision of treatment and access of health service users [26]. This near universalization of access to hypertension treatment in the SUS reflects government policies prior to 2015, such as improving access to antihypertensive medication, known as the Popular Pharmacy Program of Brazil and Saúde não Tem Preço, which guarantee free antihypertensive drugs in accredited pharmacies and in Primary Health Care facilities [27–30].

Even in the context of broad access to medication, hypertension control was less than expected. Other strategies for better control should be taken into account, including adherence to treatment [10, 13, 17, 25, 31]. For instance, the linkage and accountability of both the professional and the user [26] are necessary elements to ensure the longitudinality of care. Educational actions could be a linkage strategy, but they are not highly valued and have low frequency [26]. Therefore, the establishment of non-pharmacological measures is crucial for the control of hypertension as coadjuvants interventions to medications treatment. Reducing sodium intake, regular physical activity, smoking cessation and weight control should be considered [32–34].

Another finding of the study was the differences between population subgroups according to sociodemographic variables. These results indicate that it is feasible to improve performance in the prevalence of awareness and control and treatment of hypertension at least from a population perspective. In this study, women showed greater awareness, treatment and control of hypertension, probably due to women's greater access to health services, reported in several studies [17, 35, 36]. In addition to the behavior of greater care for their health and, consequently, greater demand for care [25, 37], primary care assistance programs focus on the maternal and child component [9], including preventive consultations and examinations, and prenatal care. Thus, a more extensive demand for the use of health services creates opportunities for the diagnosis of chronic conditions, such as hypertension, as well as for their treatment and control.

Another aspect, the higher prevalence of treatment and control in participants who declared themselves white may reflect structural inequalities in Brazilian society [17, 38], being responsible for unequal distribution of social resources, knowledge, employment opportunities and socioeconomic status [33]. Corroborating this hypothesis, a Brazilian study showed a higher prevalence of poor access to health services [39, 40]. Similarly, in the context of social inequalities, the highest prevalence of hypertension control was observed in participants with high education, reflecting the influence of greater access to information, understanding of the health problem and adherence to treatment [13, 41]. A cohort study conducted with a population of different socioeconomic levels, professors and administrative technicians of Brazilian public universities, showed higher proportions of awareness (80.2%) and control of hypertension (69.4%) [17].

In this study, contrary to studies in the literature, participants without partners had higher prevalence of awareness of hypertension, probably explained by survival bias. A separate comment deserves the increase in age associated with a higher proportion of awareness and treatment of hypertension already consolidated in other studies [11, 13, 17, 42–44]. The presence of other comorbidities, mostly NCDs and their risk factors, which increases with age are strong contributors [45, 46]. However, in the elderly there is evidence of falls [13, 14, 42] associated with senescence [47–49], use of multiple medications [50], pharmacological interactions, adverse events and low adherence to treatment [51]. Moreover, there is a lack of consensus regarding the therapeutic goal to be achieved by the elderly, as there is for the adult population [49].

Among the limitations of this study there is the use of casual blood pressure measurement to assess the management of hypertension, which could cause classification bias, but used in similar studies [13, 17]. The absence of data on antihypertensive medication, time of use and adherence is another limitation. Another limitation of this study is the absence of data on access to healthcare services. Although our primary focus was on sociodemographic aspects, we recognize that access to healthcare plays a crucial role in the adequate control and treatment of hypertension. Furthermore, being a cross-sectional survey, it does not allow for causal inferences regarding the associations observed between sociodemographic factors and hypertension treatment outcomes. Another limitation of this study is the absence of more specific data on access to healthcare services. Although our primary focus was on sociodemographic aspects, we recognize that access to healthcare is important to the adequate control and treatment of hypertension. On the other hand, aspects of validity of the study include the use of measured BP in the population, which makes the analysis possible. It is recommended to include these measures in future editions of the PNS, since in the 2019 edition blood pressure measurement was not performed, preventing the reproducibility of this study and the monitoring of these variables of interest regarding this condition, beyond the disease prevalence itself.

Conclusion

This study reveals that although a high percentage of hypertensive patients are taking medication, there are still substantial gaps in awareness and control, particularly among certain sociodemographic groups. Men, those with less schooling, black and brown people, those living in rural areas and those without health insurance have lower levels of awareness and control of hypertension. These findings highlight the presence of socioeconomic and demographic inequalities in hypertension control, emphasizing the need for targeted health policies and interventions. Prioritizing these vulnerable groups can improve the overall management of hypertension and reduce one of the main cardiovascular risk factors, addressing disparities in health outcomes across Brazil.

Effective detection, treatment and control of arterial hypertension (hypertension are fundamental at a national level to reduce the risk of cardiovascular disease in the Brazilian population.

Abbreviations

SUS	Unified Health System
NCD	Chronic Non-Communicable Disease
PNS	National Health Survey
IBGE	Brazilian Institute of Geography and Statistics
95%CI	95% Confidence Interval
PR	Prevalence Ratio

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Not applicable.

Authors' contributions

Study design and planning—MASV; MSFM; GVM. Analysis and interpretation of data—MASV; MSFM; GVM. Drafting or revising the manuscript: MASV; MSFM; GVM; LABT; MJSS; FCDA; DCM. All authors have reviewed and approved the final version of the manuscript and agree to be responsible for the content of the article.

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Data availability

The data that support the findings of this study are openly available in Brazilian Institute of Geography and Statistics (IBGE) at https://www.ibge.gov.br/estatisticas/sociais/saude/9160-pesquisa-nacional-de-saude.html?=&t=microdados.

Declarations

Ethics approval and consent to participate

The PNS was approved by the National Research Ethics Committee with its opinion: CAAE n° 10853812.7.0000.0008 and complies with all ethical precepts, in accordance with the recommendations for research with human beings of Resolution 466/12.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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