ORIGINAL ARTICLE

Accuracy of self-reported systemic arterial hypertension in adults, Rio Branco, Acre, Brazil*

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Abstract

Objective: to analyze the validity of self-reported systemic arterial hypertension (SAH) in the adult population of Rio Branco, Acre, Brazil. **Methods:** this was a study of diagnostic accuracy with 576 adults aged 18 to 59 years; accuracy, sensitivity, specificity and positive and negative predictive values were calculated in order to build the Receiver Operating Characteristic (ROC) curve. **Results:** the prevalence rates of measured SAH (gold standard) and self-reported SAH were 19.6% and 16.6%, respectively; self-reported SAH showed 53.7% sensitivity and 92.4% specificity; sensitivity ranged from 29.9% in individuals under 40 years of age, to levels above 70.0% among obese individuals and those who reported having dyslipidemia; specificity varied from 70.0% in those who self-reported diabetes mellitus, to 95.3% in underweight patients; the area under the ROC hypertension analysis curve was 0.77 (95%CI 0.72;0.81). **Conclusion:** self-reported SAH in adults 40 years old and over was found to be accurate for use in studies in Rio Branco.

Keywords: Hypertension; Data Accuracy; Cross-Sectional Studies; Adult; Sensitivity and Specificity; Diagnosis.

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Introduction

Systemic arterial hypertension (SAH) is a relevant factor associated with cardiovascular comorbidities, causing a decrease in quality of life and in life expectancy as well as increased socioeconomic expenditure. The number of surveys aimed at estimating SAH prevalence has increased. This increase has occurred because of the importance of having information on SAH frequency and complications in different populations, the need to evaluate and monitor SAH prevention and control actions, in addition to supporting the preparation of proposals for interventions. SAH prevalence can be estimated by measuring blood pressure or by self-reported accounts of the disease.[1]

Identifying SAH by measuring blood pressure is more accurate, but places a burden on research, because it involves health professionals, use of equipment, preparation of the patient and a standardized technique for measurement.[2,3] The costs for the public health system are lower when SAH is self-reported through interviews or questionnaires, this being a more accessible and rapid method for its estimation in epidemiological studies. This method, however, is more subject to errors: information depends on the participant having knowledge of previous diagnosis, as well as depending on the characteristics of the data collection instrument and how it is understood by the population to which it is administered.[4,5] Given this context, the need exists to study the validity of self-reported SAH,[3] in order to make its use feasible in studies and surveillance of this disease in the population.

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Studies disagree as to the validity of self-reported SAH, the prevalence of which may be underestimated or overestimated.[6,7] A systematic review of accuracy of self-reported SAH chose five studies conducted in Brazil, being the country with the largest number of articles selected to comprise the review. Two of the Brazilian studies found that self-reported SAH prevalence was overestimated, while a further two found that it was underestimated. It is worth mentioning that among the Brazilian studies listed in that systematic review, none was carried out in the northern region of the country.[8]

Given the importance of knowledge about SAH prevalence gained from epidemiological studies, it is appropriate to check their validity, through indicators of accuracy of self-reporting by the population to be evaluated. Given the methodological and regional differences between existing studies in Brazil,[8] it is imperative to conduct investigations of this nature, given that Brazil is a country of continental proportions and the validity of self-reported SAH in certain places does not guarantee the necessary security for use of these validations throughout the entire country, especially in the Amazon region.

Lack of population-based data on the prevalence of physically measured SAH in Rio Branco, capital of the state of Acre, in northern Brazil, as well as lack of knowledge as to the validity of self-reporting by the population for its use in epidemiological research, have motivated us to conduct this study, the objective of which was to analyze the validity of self-reported SAH in the adult population of Rio Branco.

Methods

This was a study of validity of self-reported SAH in adults by means of evaluation of indicators of diagnostic accuracy. The source of data used was the 'Study of Chronic Diseases' or 'EDOC' survey. EDOC consisted of two surveys: EDOC-A, conducted with adults (18 to 59 years); and EDOC-I, with the elderly (60 years and older). All individuals surveyed were resident in Rio Branco, the capital of the state of Acre, from April to September 2014.

The survey's population data was based on the 2010 Demographic Census conducted by the Brazilian Institute of Geography and Statistics (IBGE), which indicated that Rio Branco was the sixth most populous city of the Northern region, with 336,038 inhabitants and 96,276 households distributed over 338 census enumeration areas (CEAs).

The sampling plan was prepared considering two stages: CEA; and household. The selection of the CEAs was done based on probability proportional to the number of private households found by the 2010 Census. The households were selected by equiprobability systematic sampling, and all the adults residing therein were interviewed. Individuals with cognitive impairments who were unable to communicate or understand the questions and pregnant women were excluded from the research population.

The sample size was calculated considering 15% prevalence of renal function alteration in adults,[9] with a 95% confidence level and absolute error of 3 percentage points[10] for simple random sampling of proportions. This procedure resulted in a sample of 652 adults. Dividing this sample size by the average number of adults per household, as per the 2010 Census, 440 households needed to be selected. Once these parameters had been set, we decided to select 40 CEAs with 11 households per CEA. For the effective EDOC-A sample size, observation weights were set in order to produce estimates in relation to the population estimated by IBGE as at the 1st of July 2014. Taking into consideration one-off losses of information for certain variables, subsamples were created and the observation weights were recalibrated to produce population estimates. Details of the sampling plan, observation weight calibration, subsamples and other EDOC methodological procedures are described by Amaral et al.[11]

Demographic and socioeconomic data, as well as information on lifestyle habits and health, were obtained be means of a structured questionnaire administered by trained interviewers. In our analysis we used data on age range (in years: 18-39; 40-59), sex, educational level (no schooling; elementary education; high school; higher education), marital status (with partner; without a partner), self-reported morbidities (diabetes mellitus; dyslipidemia; stress), practicing physical activity (yes [at least once per week]; no), tobacco smoking (non-smoker, smoker or former smoker) and regular consumption of alcoholic beverages (yes; no).

Self-reported SAH was found to exist by asking the question "Have you ever been diagnosed by a doctor as having hypertension (high blood pressure)? Cases of self-reported SAH were considered to be those who reported this diagnosis.

Blood pressure (BP) measurement was performed by health professionals on the day after the questionnaire had been administered, waiting for at least 30 minutes following the last intake of caffeine or last cigarette smoked. Participant were instructed to sit with their legs uncrossed, feet flat on the floor, with their back against the chair, and to relax with their arm free from clothing at the height of their heart and supported with the palm facing upwards and the elbow slightly flexed. The cuff was well adjusted, 2 to 3cm above the antecubital fossa. BP was measured using the Beurer® digital monitor. Three measurements were taken: the first after 5 minutes of rest; and the other two at 2 minute intervals. The final BP value was calculated by taking the arithmetic average of the second and third measurements.[2]

Measured SAH cases were considered to be those with average BP readings of ≥140 mmHg for systolic BP and/or ≥90 mmHg for diastolic BP, or current use of antihypertensive medication.[2] Measured SAH diagnosis was considered to be the SAH gold standard in our study. The cut-off point was defined a priori, both for the test indicator (self-reported) and for the gold standard. Current use of antihypertensive drugs was identified from medical prescriptions or the packaging of medicinal products in current use.

The participants were weighed on digital scales placed on a flat surface (G-Tech® BalGl 200); and their height was measured by a portable stadiometer (Sanny®). Body mass index (BMI), obtained from the ratio between weight (kg) and height in square meters (m^2), was classified into three groups: <25kg/m^2 (normal or low weight); 25 to <30kg/m^2 (overweight); and ≥ 30kg/m^2 (obesity).[12]

The data were analyzed descriptively and also in an exploratory manner, in order to assess the distribution of the variables and to characterize the population studied. The categorical variables were described according to the distribution of the proportions. Prevalence rates of self-reported and measured SAH were calculated and compared using the McNemar chi-square test with a 95% significance level. The validity of self-reported SAH, taking measured SAH as the gold standard, was expressed using accuracy, sensitivity, specificity and positive and negative predictive value indicators. These indicators were presented according to socioeconomic and demographic information, lifestyle habits and reported morbidities (stress, diabetes and dyslipidemia).

The Receiver Operating Characteristic (ROC) curves, for evaluating systolic blood pressure and self-reported SAH, stratified by sex and age, were analyzed to obtain the areas under the curve and their respective confidence intervals (95%CI): a result equal to 1.0 means that it is a perfect test; while a result of less than 0.5, means that the test variable response is due to chance. Data analysis was performed using the SAS® statistical package, version 9.4, with a significance level of $\alpha = 0.05$.

All the analyses took into account the effect of the sampling design and calibrated observation weights, observation frequency expressed by 'n', and their corresponding population, by extrapolating the sample to the population based on 'n expanded' (N).

The research project met the ethical precepts of National Health Council (CNS) Resolution No 466, dated 12 December 2012, and was approved by the Human Research Ethics Committee at the Federal University of Acre (CEP/UFAC): Certification of Submission for Ethical Appraisal (CAAE) No. 17543013.0.0000.5010, dated 30 January 2014. All participants signed a Free and Informed Consent form.

Results

Six hundred and eighty five adults were assessed, 644 of whom had their blood pressure measured and answered a questionnaire regarding the presence or absence of hypertension. This corresponded to 211,902 individuals after extrapolating the sample to the population. There was no statistically significant difference between analyzed and excluded individuals, according to sex and age (p>0.05).

Among the individuals with measured SAH, the majority were male, in the 40-59 age range, had self-reported White race/skin color, had schooling up to elementary education level, were workers, had partners, were sedentary, smokers or former smokers, overweight or obese, with self-reported diabetes and dyslipidemia. When comparing the distribution of the variables according to the way SAH was identified, self-reported SAH was underestimated in males, those who had an occupation, were overweight and who reported having diabetes (Table 1).

Prevalence of self-reported SAH was 16.6% (95%CI 13.2;20.7), while prevalence of measured (gold standard) SAH was 19.6% (95%CI 16.5;23.1).

When comparing self-reported SAH with the gold standard, the accuracy of self-reported SAH was high: the results were correct in more than 80.0% of cases, for the majority of the variables investigated. Sensitivity revealed that 53.7% of hypertensive individuals were correctly identified by self-reporting, while 92.4% of non-hypertensive participants reported correctly their condition (Table 2).

Self-reported SAH sensitivity was lower among young individuals (29.9%) and the overweight (37.2%). The lowest positive predictive value (PPV) was found in the 18-39 year age range (35.3%) and the lowest negative predictive value (NPV) was found in those with diabetes (50.7%). Accuracy was greater than 79% in all the analyzed variables, except for diabetes (Table 2).

The ROC curve used to analyze SAH had an area under the curve (AUC) of 0.77 (95%CI 0.72;0.81), pointing to agreement between diagnosis based systolic blood pressure measurement and self-reported SAH diagnosis in the population surveyed (Figure 1). In the ROC curve analysis stratified by sex, females had an AUC value of 0.77 (95%CI 0.72;0.82), while for males AUC was 0.78 (95%CI 0.69;0.87). In the age strata, AUC in the up to 40 years age group was 0.75 (95%CI 0.67;0.83), while in the 40 years and over age group it was 0.71 (95%CI 0.65;0.77).

Discussion

Self-reported SAH was classified as a good method for estimating arterial hypertension in epidemiological studies with adults, in Rio Branco, Acre. Nevertheless, it should be used with caution in those aged under 40 years old, the overweight and those self-reporting diabetes.

Prevalence of self-reported SAH was lower than prevalence of measured SAH, although this difference did not prove to be statistically significant. This result is corroborated by a study conducted in Canada, where prevalence of self-reported SAH was 18.2% and prevalence of measured SAH was 20.3%.[13] Research conducted in North Carolina (USA) with people aged over 18 years old also pointed to underestimated prevalence of self-reported SAH (16.1%) in relation to measured SAH (24.8%).[14] We found underestimated self-reported SAH with statistically significant differences among males, people with an occupation, those overweight according to BMI and those self-reporting diabetes. In contrast, a Brazilian study carried out in Pelotas, RS, showed that overall prevalence of hypertension was overestimated when self-reported, and that this was also confirmed among individuals under 49 years old and among females.[4]

Table 1 – Prevalence of self-reported and physically measured (gold standard) systemic arterial hypertension, according to variables analyzed in adults in Rio Branco, Acre, 2014

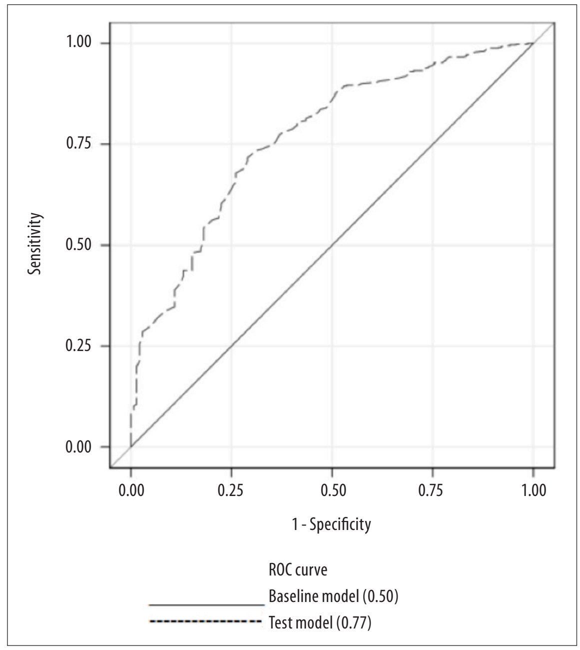
Variables	Total		Systemic arterial hypertension							
			Physically measured				Self-reported			
	n	N[a]	n	N[a]	%[b]	$IC_{95\%}$[c]	n	N[a]	%[b]	$IC_{95\%}$[c]
Sex										
Male[d]	197	101,624	59	22,017	21.7	16.3;28.2	44	15,879	15.6	10.4;22.7
Female	447	110,278	108	19,556	17.7	14.6;21.4	99	19,355	17.6	14.1;21.6
Age group (in years)										
18-39	339	146,447	34	15,640	10.7	7.1;15.8	32	13,252	9.0	5.6;14.3
40-59	305	65,455	133	25,933	39.6	39.2;46.8	111	21,981	33.6	26.7;41.2
Ethnicity/skin color										
White	120	38,846	37	10,473	27.0	18.4;37.6	30	7,348	18.9	12.0;28.5
Non white	524	173,056	130	31,101	18.0	14.5;22.0	113	27,886	16.1	12.6;20.3
Education Level[e]										
Middle and higher education	272	96,332	53	14,251	14.8	10.5;20.4	43	10,941	11.4	8.0;15.8
Up to elementary education	358	111,524	113	27,114	24.3	19.2;30.3	97	23,438	21.0	16.3;26.7
Occupation										
No	334	96,366	80	15,563	16.2	12.5;20.6	79	16,448	17.1	13.1;22.0
Yes[d]	310	115,536	87	26,010	22.5	17.7;28.2	64	18,786	16.3	11.4;22.7
Marital status[e]										
With a partner	306	98,269	97	24,776	25.2	20.1;31.2	76	20,212	20.6	15.8;26.3
Without a partner	335	112,747	69	16,589	14.7	11.5;18.6	66	14,813	13.1	9.6;17.7
Physical activity[e]										
Yes	164	70,284	38	11,335	16.1	10.0;25.0	31	9,064	12.9	8.8;18.6
No	477	140,328	127	29,808	21.2	18.1;24.7	110	25,739	18.3	14.2;23.3
Smoking[e]										
Non-smoker	348	122,593	76	21,484	17.5	13.6;22.2	63	16,696	13.6	10.0;18.3
Smoker or former smoker	292	88,230	91	20,089	22.8	17.5;29.1	79	18,221	20.7	16.1;26.0
Consumption of alcoholic beverages[e]										
No	463	142,147	128	29,461	20.7	17.2;24.8	112	26,343	18.5	14.8;23.0
Yes	155	60,885	33	9,762	16.0	10.5;23.7	24	7,182	11.8	6.9;19.4
Body mass index (BMI)[e]										
Underweight (<25Kg/m²)	250	91,213	37	9,579	10.5	6.8;16.0	39	9,189	10.1	6.8;14.6
Overweight (25 to <30Kg/m²)[d]	238	75,831	70	17,376	22.9	17.4;29.6	45	10,964	14.5	10.1;20.3
Obese (≥30Kg/m²)	141	39,763	53	13,154	33.1	26.6;40.3	53	14,171	35.6	24.8;48.2
Self-reported stress										
No	464	153,855	125	30,643	19.9	16.0;23.4	99	24,844	16.1	12.6;20.5
Yes	160	50,794	37	9,493	18.7	11.9;28.2	41	9,712	19.1	13.1;27.1
Self-reported diabetes[e]										
No	604	198,959	143	34,869	17.5	14.6;20.9	123	30,611	15.4	12.0;19.4
Yes	33	10,886	20	6,027	55.4	35.1;74.0	16	3,946	36.2	21.2;54.5
Self-reported dyslipidemia[e]										
No	575	193,580	139	35,173	18.2	15.2;21.4	116	29,451	15.2	11.8;19.3
Yes	56	14,687	24	5,207	35.5	21.2;52.9	26	5,471	37.2	25.1;51.2
Total	644	211,902	167	41,573	19.6	16,5;23,1	143	35,234	16.6	13.2;20.7

a) N = N expanded based on observation weights and sample design.
b) %: proportion based on N expanded.
c) 95%CI: 95% confidence interval.
d) McNemar Test significant (p<0.05).
e) Differences in relation to the total are due to lack of information in the variable.

Table 2 – Accuracy of self-reported systemic arterial hypertension, according to independent variables in adults, Rio Branco, Acre, 2014

Variables	Accuracy	Sensitivity (95% CI)	Specificity (95% CI)	Predictive values	
				Positive (95% CI)	Negative (95% CI)
Self-reported SAHb	84.8	53.7 (53.2;54.2)	92.4 (92.3;92.5)	63.3 (61.3;77.2)	89.1 (85.6;91.6)
Sex					
Male	84.4	50.0 (49.3;50.6)	93.9 (93.7;94.0)	69.3 (57.5;87.9)	87.2 (81.3;92.8)
Female	85.2	57.8 (57.1;58.5)	91.1 (90.9;91.3)	58.4 (58.8;77.3)	90.9 (85.8;92.6)
Age (in years)					
18-39	86.7	29.9 (29.2;30.6)	93.4 (93.3;93.6)	35.3 (13.1;45.0)	91.8 (91.7;97.2)
40-59	80.7	68.0 (67.4;68.6)	89.0 (88.7;89.3)	80.2 (74.2;89.4)	80.9 (73.7;85.6)
Ethnicity/skin color					
White	84.3	55.9 (55.0;56.9)	94.7 (94.5;95.0)	79.7 (59.0;91.0)	85.3 (80.7;94.9)
Non white	90.3	52.9 (52.4;53.5)	91.9 (91.8;92.1)	59.0 (58.9;77.1)	89.9 (85.4;92.0)
Marital status					
With a partner	79.2	49.4 (48.9;50.2)	89.2 (89.0;89.4)	60.6 (58.7;80.4)	84.0 (78.6;88.9)
Without a partner	86.7	40.7 (40.0;41.5)	94.8 (94.7;95.0)	57.6 (56.6;80.1)	90.3 (89.0;95.6)
Education Level					
Up to elementary education	82.2	56.7 (56.1;57.3)	90.4 (90.3;90.6)	65.6 (94.7;95.0)	86.7 (94.7;95.0)
Middle and higher education	87.8	47.2 (46.4;48.1)	94.9 (94.7;95.0)	61.5 (94.7;95.0)	91.2 (94.7;95.0)
Occupation					
No	88.4	66.8 (66.0;67.5)	92.5 (92.3;92.7)	63.2 (61.9;82.6)	93.5 (87.1;94.6)
Yes	81.9	45.8 (45.2;46.4)	92.3 (92.2;92.5)	63.5 (53.3;77.7)	85.4 (81.6;90.8)
Practice of physical activity					
Yes	84.9	43.2 (42.3;44.1)	92.9 (92.7;93.1)	54.0 (62.1;79.6)	89.5 (85.5;92.3)
No	84.6	57.0 (56.4;57.6)	92.1 (91.9;92.2)	66.0 (44.7;81.2)	88.8 (81.7;93.5)
Smoking					
Non-smoker	85.9	48.7 (48.1;49.4)	93.8 (93.7;94.0)	62.7 (40.9;80.8)	89.6 (77.1;91.6)
Smoker and former smoker	83.4	59.0 (58.3;59.7)	90.7 (90.4;90.9)	65.0 (52.9;78.0)	88.2 (86.4;93.8)
Alcoholic beverages consumption					
No	84.5	57.4 (56.8;57.9)	91.6 (91.5;91.8)	64.2 (63.9;81.9)	89.2 (85.2;92.1)
Yes	87.7	48.6 (47.6;49.6)	95.2 (95.0;95.4)	66.0 (38.8;75.5)	90.6 (82.7;93.9)
Body mass index (BMI: kg/m²)					
Underweight (< 25Kg/m²)	91.1	55.5 (54.5;56.5)	95.3 (95.1;95.4)	57.9 (40.7;77.8)	94.8 (88.4;96.4)
Overweight (25 to <30Kg/m²)	79.7	37.2 (36.5;37.9)	92.3 (92.1;92.5)	59.0 (53.4;81.4)	83.2 (81.1;91.5)
Obese (≥30Kg/m²)	79.7	73.1 (72.4;73.9)	82.9 (82.4;83.4)	67.9 (64.0;86.0)	86.2 (79.4;92.6)
Self-reported stress					
No	84.7	52.0 (51.5;52.6)	92.8 (92.6;92.9)	64.2 (61.3;80.0)	88.6 (83.3;90.5)
Yes	86.8	65.8 (64.9;66.8)	91.6 (91.3;91.9)	64.3 (50.7;80.9)	92.1 (89.1;98.2)
Self-reported diabetes					
No	86.7	52.6 (52.1;53.1)	93.7 (93.6;93.8)	63.0 (57.9;76.1)	90.6 (86.4;92.3)
Yes	63.3	59.4 (58.2;60.6)	70.0 (68.5;71.5)	76.8 (67.8;100.6)	50.7 (40.0;93.3)
Self-reported dyslipidemia					
No	85.4	51.8 (51.3;52.3)	92.9 (92.8;93.0)	61.9 (57.4;75.3)	89.7 (85.6;91.7)
Yes	83.0	78.6 (77.5;79.7)	85.4 (84.7;86.2)	74.8 (72.0;100.0)	87.9 (75.3;100.0)

a) 95%CI: 95% confidence interval.
b) SAH: systemic arterial hypertension.



Note:
ROC: Receiver operating characteristic.

Figure 1 – Receiver operating characteristic curve comparing self-reported systemic arterial hypertension and systolic blood pressure in Rio Branco, Acre, 2014

Prevalence of self-reported SAH found by the VIGITEL System Survey (Telephone Surveillance of Noncommunicable Disease Risk and Protective Factors), conducted in the Brazilian state capitals in 2012, ranged from 15.2% (Tocantins) to 28.7% (Rio de Janeiro), with 22.3% prevalence in Rio Branco.[15] However, according to data from the National Health Survey (PNS) in 2013, prevalence of self-reported hypertension in Acre state was 16.1% (12.6% for males and 19.3% for females),[16] while in another survey conducted in 2013 which also measured SAH, the prevalence of SAH was 15.6%, with higher prevalence among males (15.8%) when compared to females (10.8%),[17] thus reinforcing the findings of our study.

Self-reporting is considered an important method for surveillance of SAH in the population.[4] However, only measurement of arterial pressure enables detection of new cases, thus enabling the formulation of strategies for noncommunicable disease prevention and control.[18] Population studies reveal lack of knowledge of the health situation in Brazil. In Nobres, MT, for example, a study carried out with 1,003 individuals over 18 years old showed that 26.5% of those who had hypertension were unaware of their condition.[19]

One way of evaluating the validity of self-reported SAH is to compare it with measured blood pressure and calculate its sensitivity, specificity and predictive values - especially positive predictive values – with the aim of estimating the probability of an individual really being hypertensive when they report being so.

A global systematic review published in 2018, with meta-analysis on data from 112,517 adults, highlighted the importance of investigating the accuracy of self-reported SAH before adopting it as a tool for evaluation, due to the variation found in different populations;[8] it also found self-reported SAH sensitivity of 42.1% (95%CI 30.9;54.2) and specificity of 89.5% (95%CI 84.0;93.3). Despite low accuracy, the same review showed that in Brazil the result was better,[8] reinforcing the findings found by our study that showed slightly higher values: 53.7% sensitivity and 92.4% specificity.

Higher sensitivity and specificity values have been identified in other studies. In the south of Spain between 2001 and 2003, the ability of self-reported SAH to detect the hypertensive was shown to be low (49.4% sensitivity and 96.8% specificity), when compared to the gold standard. That study deemed self-reported information to be invalid for estimating SAH prevalence in that population.[5] A survey conducted in São Paulo, in 2008 and 2010, found 71% sensitivity for self-reported SAH among those aged over 20.[3] In the United States, the National Health and Nutrition Examination Survey III (NHANES III) for the period 1998-1991,[20] carried out with people aged over 24, identified 71% sensitivity and 90% specificity. It is noteworthy that the NHANES Survey is the main source of data for SAH surveillance in the USA. Among immigrants aged 18 or more and living in New York, self-reported SAH showed 77.8% sensitivity and 89.9% specificity.[21] A survey carried out in Pelotas with people aged over 20 found 84.3% sensitivity and 87.5% specificity.[4]

In our research, we identified and positive and negative predictive values lower than those reported by the studies mentioned in the previous paragraph: NHANES III (72% and 89%, respectively),[20] Spain (89.4% and 77.8%),[5] São Paulo (73.7% and 78.5%)[3] and Pelotas (73.9% and 93.0%).[4] These results show that self-reported SAH prevalence is close to measured SAH, indicating its validity in surveys in these populations. However, it should be emphasized that predictive values, especially PPV, are highly dependent on the prevalence of the event in the population studied. In this sense, the greater magnitude of these indicators found in such studies, when compared with our findings for Rio Branco, can be explained, in part, by the greater availability of health services in those regions.

It is worth noting that in our study, sensitivity of self-reported SAH was greater among women and older workers (40-59 years old). Another Spanish study with adults aged 30-69 pointed in the same direction, presenting greater sensitivity among women and older individuals, showing, in addition, increased sensitivity among those who had less schooling and were obese.[22] In the study conducted in Pelotas, females presented 92.2% sensitivity and 72.9% PPV, while in males sensitivity was 72.7% and PPV was 75.8%, whereby these values increased with effect from 50 years of age.[4] High sensitivity of self-reported SAH in women, both in this study in Rio Branco and in other studies, may result from greater use of health services by the female population.[23] In turn, greater sensitivity among older people may relate to the fact that knowledge of having the disease increases as age advances[24] and/or with the emergence of morbidities that lead people to seek their doctor and thus facilitate diagnosis of SAH.[3,4,25]

Higher levels of sensitivity and PPV were found among those who reported comorbidities, unlike findings in Colorado (USA), where (i) there was 73.2% sensitivity and 88.2% PPV among those who reported diabetes, while (ii) sensitivity was 59.1% and PPV was 62.7% for those who reported hypercholesterolemia.[26] In a Brazilian study carried out in the city of São Paulo (2008 and 2010), higher levels of these self-reported SAH accuracy criteria occurred among obese people (78.3% sensitivity and 72.3% PPV) and those who reported having diabetes mellitus (88.9% sensitivity and 76.9% PPV),[3] corroborating the findings of our study. Morbidities such as obesity and diabetes mellitus require a greater number of medical consultations and examinations for monitoring, thus enhancing knowledge of one's own health condition.[3,4,25] Additionally, obesity, diabetes mellitus and dyslipidemia are factors associated with hypertension.[27] However, the following finding of our study should be highlighted: among individuals who reported having diabetes, approximately 50% reported not having previous diagnosis of SAH, suggesting that adults are more concerned about diagnosis of diabetes than diagnosis of hypertension.

Low schooling levels among adults in Rio Branco appeared as an important factor for the accuracy of self-reported SAH. In São Paulo, sensitivity of self-reported SAH was greater among those who had less than nine years of schooling (77.9% sensitivity; 74.9% PPV).[3] This supports the assertion that adverse socioeconomic status, represented by lower levels of schooling, contributes to the emergence of morbidities,[24] greater demand for health services and consequent diagnosis of diseases. Another important element to consider is the monitoring of this population by the Family Health Strategy (FHS), the care model of which prioritizes coverage of areas inhabited by more vulnerable populations.[3]

Also worthy of mention is the frequency of false-negative self-reported SAH, whereby we found higher proportions of people unaware that they had SAH, in particular males, people aged up to 39 years old, smokers, alcohol drinkers, individuals with greater schooling, those who did no physical exercise, were overweight and had an occupation. These indicators signal the importance of educational prevention actions geared to these population groups. These results are corroborated by a study conducted in Ribeirão Preto, São Paulo state, where males, youth, workers and people with higher schooling stood out as those who least seek health services.[28] This finding can be explained (i) by the fact that employers do not always facilitate workers seeking care of their own health, (ii) higher levels of schooling imply greater demand for health services and, furthermore, (iii) the need among young people to achieve equilibrium between work and study is still common.[29]

Some limitations of this study need to be considered. The first limitation relates to self-reported SAH and blood pressure measurement data having been collected on different days, even though the time interval was short enough to ensure that there was no change in the participants' state of health. A further limitation can be considered to be defining hypertension (gold standard) by means of one-off measurement, although this was mitigated by taking three measurements in a row, following the recommendations with regard to rest, positioning and interval between measurements, and using the average of the last two measurements of systolic and diastolic blood pressure. Another potential limitation is memory bias: participants needed to remember previous diagnosis of SAH by a health professional. Finally, a limitation may be the simplification of the definition of some variables, such as physical activity and consumption of alcohol, in addition to loss of information regarding some participants, although there were no significant differences between the groups in relation to age and sex.

As for its strong points, this study demonstrates the validity of self-reported hypertension in the adult population of Rio Branco, supports future studies of prevalence and contributes to compensating for the scarcity of studies of this nature available about the northern region of Brazil.

Not infrequently, self-reporting is a viable option for obtaining data on health. Self-reported SAH, the theme of this study, is valid in population studies, as long as due caution is taken when assessing young people up to 39 years old, males, workers, overweight people and those reporting diabetes, due to its low sensitivity and low positive predictive value. These results demonstrate the need for public health measures to be taken by health authorities in the capital city of Acre state, geared to this audience in order to raise their awareness of their own health condition, favoring actions of prevention and control of noncommunicable diseases and other ailments.

Prevalence studies are needed since they provide information on the health status of the population. Validation of information on self-reported noncommunicable diseases is important for surveillance of increasing morbidities, in view of current behavioral changes and changes in the age structure of Brazilian society.

Authors' contributions

Amaral TLM, Monteiro GTR, Amaral CA and Vasconcellos MTL contributed to the design of the study. Amaral TLM, Melo CL and Amaral CA contributed to data collection, analysis and interpretation and writing the article. All authors contributed to the critical review of relevant intellectual content, approval of the final version and are responsible for all aspects of this article, ensuring the accuracy and completeness of all parts thereof.

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