Original Article

Arterial Hypertension in the Adult Population of Salvador (BA) - Brazil*

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Objective: To estimate the prevalence of hypertension (H) and its association with other cardiovascular risk factors in a highly multiracial population.

Methods: A cross-sectional study carried out in Salvador, Brazil, in a population sample of 1439 adults ≥ 20 years of age. All participants completed a questionnaire at home and had the following measurements taken: blood pressure, body weight, height, waist circumference (WC), and serum glucose and lipids. Hypertension was defined as mean SBP ≥140 and/or DBP ≥ 90 mmHg. Hypertension prevalence was estimated with a 95% confidence interval (CI). The associations were measured by the adjusted odds ratio (AOR), using regression analysis.

Results: Overall prevalence of H was 29.9%: 27.4% CI (23.9-31.2) in men and 31.7%, CI (28.5-34.9) in women. Among black men, this prevalence was 31.6%, and among black women, 41.1%. Among white men it was 25.8%, and among white women, 21.1%. Arterial hypertension was significantly associated with age ≥ 40, overweight/obesity (AOR = 2.37[1.57-3.60]) for men and 1,62 (1.02 - 2.58) for women. Among men, H was associated with a high level of education and among women, with dark brown and black skin, abdominal obesity, AOR = 2.05 CI (1.31-3.21), diabetes AOR = 2.16 CI (1.19-3.93), and menopause.

Conclusion: Arterial hypertension predominated among black people of both genders, and in women. Those variables that remained independently associated with H differed in both genders, except overweight/obesity. Our results suggest the need for an in-depth study of H among black people and early, continuing educational interventions.

Key words: Hypertension, prevalence, race, ethnicity, overweight.

Arterial hypertension (H) is the most important modifiable cause of early cardiovascular mortality throughout the world, particularly of stroke. Highly prevalent and known for several decades in industrialized countries, and during the last decade in some developing countries[1-5], the interest in H epidemiology remains consistent over time. This is partly due to historical facts about H, such as high level of unawareness of the blood pressure status by the general population, noncompliance with treatment and/or poor BP control among those who treat thenselves[6-8]. This demonstrates that in general strategies used so far to promote and protect health have been ineffective in changing habits and behavior incompatible with healthy living, in addition to the lack of access to high-quality medical care.

In a worldwide review, Kearny et al[1] estimated the prevalence of hypertension in the year 2000 to be ~26%, similar for both genders, with two-thirds of the hypertensive living in developing countries. These authors predicted that this prevalence would increase to ~29% by 2025, with similarity by gender maintained.

Between 1960 and 2000, hypertension rates dropped from 42% to 24%[9] in the United States; however, between 1999 and 2000, these rates rose again by about 8.3%, a worrisome increase of 30% in the total number of people with hypertension[10]. Despite this increase, H prevalence in the United States and Canada proved to be lower than that of many European countries with which they were recently compared[2].

In a review of the few population-based studies on H carried out in Brazil, this condition was highly prevalent. These data cover mainly the states of São Paulo and Rio Grande do Sul[11]. The great reflects of H in the country are shown: a) in statistics on mortality, with cerebrovascular disease as the leading cause of death[12]; b) in statistics on hospital admissions for cardiovascular diseases covered by the Sistema Único de Saúde, the Brazilian national health care system (Lessa I, research report, Brazilian National Health Surveillance Agency, Ministry of Health, 2004); c) in

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the high rates of admission made necessary by hypertension itself or its complications (Lessa I, research report urgencies/emergencies, Health Department of the State of Bahia, 2002), in addition to other social costs. So far, however, this knowledge has not motivated any governmental decision to perform a standardized population-based study in the country focused on identifying regional disparities and priorities and serve as national reference. Meanwhile, prevalence studies should be encouraged in other regions, because the regional inequalities of the Brazilian population are of great magnitude, with different repercussions in the determination of health-disease.

This study was designed to estimate the prevalence of arterial hypertension and its association with other cardiovascular risk factors in the highly multiracial population of Salvador, in the Northeast of Brazil.

Methods

A cross-sectional study, using the database of the subproject "Prevalence of Cardiovascular (CVRF) and Diabetes Mellitus Risk Factors," Monitoring Project for Cardiovascular Diseases and Diabetes Mellitus (MONIT), was carried out in Salvador (Bahia) in 1999-2000. As a basis for population studies in Salvador, census tracts of 8 of the city's 10 hydrographic basins were grouped in 108 "Research Areas", classified as high, medium and low socioeconomic status. The present study was conducted in 34 of these areas, randomly selected in proportion to the number of sectors of each social class, encompassing 16,592 households, with approximately 229,162 inhabitants, 112,290 of whom were 20 years old or older.

Study sample was estimated in 1800 adults ≥ 20 years of age, based on a 25% prevalence of hypertension, 95% confidence level, and 2% design error. As many other objectives were incorporated into the study, and there was an estimated 20% loss of households (non-residential properties, vacant land, etc), the sample was extended to 2500 people. With an estimated mean of 1.7 eligible people per household, a systematic sample (interval = 10) of 1540 households was extracted, according to socioeconomic status and population density of these areas. Of these, 1458 were eligible for the study, pregnant women excluded. One thousand two hundred and fifty-eight families (81.7%) agreed to participate in the study; the others were losses due both to barriers limiting access to residents and refusal by the family. Two thousand four hundred and seventy-six interviews were scheduled; 72 (2.9%) of the selected respondents refused to participate. All participants were interviewed at home using a pretested questionnaire on CVRF, cardiovascular diseases, and diabetes, current treatment for hypertension and/or diabetes, documented through presentation of drugs, their packaging, or medical prescription and later by the examinations performed for the study. Blood pressure and waist circumference were measured. Blood pressure was measured in two different blocks, about 20 minutes apart, and consited of three consecutive readings, for a total of six readings. The sphygmomanometer used was the OMRON HEM – 705 CP electronic oscillometric device, validated and recommended by international institutions[13] and selected because of its **B** grading, for systolic blood pressure and **A** for diastolic blood pressure[13]. This kind of device may be used in epidemiological studies[14]. Its main advantages are the following: a) it is easy to train and standardize interviewers; b) it eliminates measurement bias associated to vision, hearing, and attention; c) it does not allow terminal digit preference; and d) the interviewer cannot interfere in the speed of inflation/deflation of the cuff. Blood pressure was measured with the respondent seated, feet flat on the floor, left arm relaxed and resting on a table at heart level, palm upward, bladder empty, and without having exercised moderately or heavily, nor smoked or drunk alcohol in the previous 30 minutes.

A cuff size compatible with arm circumference was used. Two waist circumference measurements were taken using a nonstretch metallic tape adjusted to the body over the skin, taking as the parameter the narrowest part of the torso, between the chest and hips (natural waist).

All respondents were referred to the central headquarters of the study in each area, where they underwent body weight and height measurements, in addition to biochemical parameters performed after a 12-hour fast (glucose, cholesterol, HDL, triglycerides), urinalysis and 12-lead ECG. These procedures were performed in the standard manner by the project team itself. Quality control of anthropometric and BP measurements were performed by mean estimates and scatter plots inter- and intraobservers, under the supervision of two co-authors and two nutritionists.

One thousand five hundred and forty-six participants (67.3% of the sample) underwent the procedures, and 107 (6.9%) completed protocols were lost to the study before they were entered into the database. The final sample of the Monitoring Project for Cardiovascular Diseases and Diabetes Mellitus (MONIT) comprised 2297 participants, 1439 of whom with complementary examinations (excluding 107 that underwent examination and were lost to the study). These 1439 comprised this study group.

Abnormality definitions and criteria:

Dependent variable – Arterial hypertension, JNC-VI criterion (Sixth Joint National Committee): systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, including hypertensive subjects under treatment[15]. The average of the last five measurements was used.

Independent variables – Overweight was defined by the body mass index, BMI (weight/height^2) ≥ 25Kg/m^2 and <30Kg/m^2 and obesity ≥ 30Kg/m^2 of body surface; central obesity (CO), defined by waist circumference (WC) cut-off points of >88 cm in men and >84 cm in women, estimated for the same population[16]; hypercholesterolaemia = serum cholesterol ≥ 240 mg/dL, Trinder enzyme method; low HDL-cholesterol = HDL-c < 40 mg/dL, Labtest method; hypertriglyceridemia = triglycerides ≥ 200 mg/dL, modified Soloni method; high LDL-cholesterol = LDL ≥ 160 mg/dL, calculated using the Friedwalder equation for triglycerides lower than 400 mg/dL; diabetes mellitus = fasting glucose ≥ 126 mg/dL (Trinder enzyme method) or lower for people under current and documented treatment for DM; smoking = current smoker, any number of cigarettes/day; excessive alcohol consumption = consumption on week-ends with frequent drunkenness and/or daily consumption with or without drunkenness; physical activity; active = subjects who referred daily and consistent practice of at least one moderate activity (ex: ironing, sweeping, car washing, work while walking without carrying heavy objects) or heavy activities during work (ex: to work walking, climbing up and down stairs or steep terrain, carrying or lifting weight; do the laundry; take care of children or impaired people; perform heavy cleaning tasks; work in civil construction) and had at least 3 hours per week of one or more of the following activities during leisure time: walking, dancing, swimming, biking, running or other sports activity, including training for competitions. The others were considered sedentary. Race/ethnicity was self-defined by skin color: white, dark brown/mulatto, black/negro, yellow and indigenous, according to the official terminology used in demographic censuses in Brazil. Those who chose another skin color were reclassified into three basic strata (Examples: light, very light, light tan = white; caboclo, cinnamon, semidark, *sarara* (mulatto with reddish kinky hair), Cape Verdean = mulatto; dark, black = negro). Schooling was stratified in low (illiterate + elementary school), medium (incomplete junior high school education), and high (≥ complete high school, that is, ≥ 11 years of schooling). The criterion used for social class was that of the Brazilian Market Research Association (ABPEME) and was condensed into three groups: high (A1 +A2+B1), medium (B2+C), and low (D+E).

Statistical analysis - For the group as a whole, stratified by gender, and for independent variables, the following were calculated: hypertension prevalence rates, 95% confidence interval (CI), and association measurements. Excluding ages, which were included in all the adjustment steps, the odds ratios (univariate analysis), with p value < 0.10, when indicated, were adjusted (AOR) to effect modifying variables using stepwise backward multiple logistic regression, retaining in the final model those with $p < 0,05$. Statistical analysis was performed using Stata statistical analysis software, version 7.0". This study is exploratory, with no predetermined hypothesis.

The project was approved by the Medical Research Ethics Committee of the State of Bahia Regional Medical Council, and all patients signed an informed consent before entering the study.

Results

Of the 1439 participants analyzed, 830 (57.7%) were women and 609 (42.3%) were men. Mean ages were 41.9 ±14.6 for women and 40.3 ± 14.1 for men ($t = 2.08$, $p > 0.05$). Table 1 shows overall characteristics, in which 46.4% were mulattos and 27.9% were blacks; low and medium education levels were 47.2% and 49.5%, respectively, and few participants had a high level of education. A majority of the participants belonged to the low social class, while only 6.2% belonged to the high social class. Of note is the high percentage of sedentary participants, with overweight or obesity, central obesity and abnormal serum lipids, except hypertriglyceridemia, which was found in 13.3%. Multiple regression showed a statistically significant adjusted OR for associations between hypertension and age, dark brown and black skin, overweight, central obesity, diabetes, and total cholesterol (table 1).

Overall prevalence of H was 29.9%, of which 31.7%, 95% CI (28.5 – 34.9) was in women and 27.4%, CI 95% (23.9 – 31.2) in men. Gender-stratified analyses are shown in Figures 1 and 2 and Tables 2 and 3. Hypertension prevalence increased with age in both genders and was already high in patients younger than 50 and exceptionally high in patients older than 50 (Fig. 1). Prevalence differences between races and between genders according to social class and education level are shown in Figure 2 and Table 2. In women, hypertension prevalence decreased linearly both from low to high level of education and from low to high social class. In men, the inverse was true, increasing from white to black and rising with the level of education, without a marked trend. Hypertension prevalence was high for all variables analyzed; smoking prevalence was lower for both genders. Hypertension prevalence above 50% was detected in diabetic and obese people of both genders and in the presence of central obesity and menopause in women. Mean age did not differ between white and black people of either gender ($p > 0,05$). Ratio of proportions (RP) showed similar prevalence for most variables in both genders, and were statistically significant for women in the 40-49 age group and for high LDL concentration; a highe level of schooling was a protective factor for this gender.

In Table 3, statistically significant odds ratios are found in all age groups, low level of education, sedentariness, overweight, central obesity, diabetes, and high cholesterol, LDL, and triglyceride levels. The association of AH with skin color was significant for mulatto and black women, as well as menopausal women, and non-significant for social class. Statistically significant associations were found in the male gender for high and low level of education, high social class, and excessive alcohol consumption. In the multivariate analysis, the following were associated with H among women: all age groups above 40, dark brown and black skin, overweight, central obesity, diabetes, and menopause. Among men, the following were associated with H: 40 years of age and above, high social class, and overweight. As for the other variables, the associations detected in the univariate analysis lost statistical significance in the multivariate analysis.

Discussion

This study aimed at performing an analysis including as large a number of cardiovascular risk factors as possible. The number of households lost to the study was below that anticipated, and the loss of eligible subjects in the original sample was less than 3%. The most important loss was partial, represented by participants that completed the questionnaire, had their blood pressure and waist circumference measured but did not show up for examinations. Because of the similarity of demographic characteristics of the participants who completed the whole protocol (except the 107 that strayed) with those documented by the 2000 census in Salvador, we decided to analyze those with completed protocols. The total sample would be not subject to criticism, but restricted to just a few risk factors. Losses similar or higher than ours are found in the literature.

Characteristics	N %	H prevalence and (95% CI)	Adjusted OR and 95% CI
Age (years)			
20-29	347 (24.1)	7.2 (4.5- 9.9)	1.0
30-39	371 (25.8)	14.9 (11.3 -18.5)	1.76 (1.05-2.94)[a]
40-49	353 (24.5)	35.9 (30.9-40.9)	4.59 (2.84-7.49)[b]
50-59	189 (13.1)	52.6 (45.5-59.7)	9.08 (5.39-15.29)[b]
60-69	114 (7.9)	69.2 (60.7-77.7)	17.54 (9.63-31.94)[b]
70 and older	65 (4.5)	70.7 (59.6-81.8)	
Race			
White	369 (25.6)	23.0 (18.7-27.3)	1.0
Dark brown	668 (46.4)	29.3 (25.8-32,8)	1.52 (1.08-2.15)[c]
Black	402 (27.9)	37.1 (32.4-41.8)	2.23 (5.39-15.29)[b]
Education level			
Low	676 (47.2)	38.0 (34.3-41.7)	NS
Médium	709 (49.5)	22.0 (19.0-25.0)	1.0
High	46 (3.2)	30.4 (17.1-43.7)	excluded
Social class			
Low	853 (59.3)	29.7 (26.6 – 32.8)	excluded
Médium	497 (34.5)	28.9 (24.9-32.9)	
High	89 (6,2)	37.1 (27.1-47.1)	excluded
Smoking			
Yes	312 (21.7)	26.6 (23.0-30.2)	excluded
No	1127 (78.3)	30.8 (27.7-33.9)	
Excessive alcohol consumption			
Yes	70 (4.9)	40.0 (36.0-44.0)	excluded
No	1369 (95.1)	29.4 (26.4-32.4)	
Physical activity			
Active	572 (39.8)	23.8 (19.1-28.5)	
Sedentary	866 (60.2)	33.9 (31.1-36.7)	NS
Overweight			
BMI ≥ 30	195 (13.6)	56.9 (49.6-63.9)	1.65 (1.17-2.32)[d]
BMI ≥ 25 <30	449 (31.2)	43.7 (40.3-47.1)	1.0
BMI < 25	795 (55.2)	19.2 (16.1-22.3)	
Central obesity			
Yes	511 (35.5)	49.3 (46.1-52.5)	1.87 (1.32-2.62)[d]
No	928 (64.5)	19.2 (15.8-22.6)	1.0
Diabetes			
Yes	120 (8.3)	66.7 (64.2-69.2)	2.01 (1.278-3.17)[e]
No	1319 (91.7)	26.5 (18.6-34.4)	1.0
Cholesterol			
> 240 mg/dL	451 (31.3)	46.7 (43.6-49.8)	1.38 (1.04-1.82)[f]
200-240 mg/dL	213 (14.8)	38.5 (32.0-45.0)	1.0
< 200 mg/dL	775 (53.9)	19.5 (16.7-25.1)	
HDL			
< 40 mg/dL	338 (23.5)	30.5 (25.6-35.4)	excluded
≥ 40 mg/dL	1101 (76.5)	29.7 (27.0-32.4)	1.0
LDL			
≥ 160 mg/dL	443 (31.2)	22.5 (19.9-25.1)	NSNS
< 160 mg/dL	977 (68.8)	44.9 (40.3-49.5)	1.0
Triglycerides			
≥ 200	192 (13.3)	42.7 (40.0-45.4)	NS
< 200	1247 (86.7)	27.9 (21.6-34.2)	1.0

Table 1 - Overall characteristics, arterial hypertension (H) prevalence, and adjusted odds ratios (AOR) of the association between cardiovascular risk factors and hypertension, Salvador, Brazil

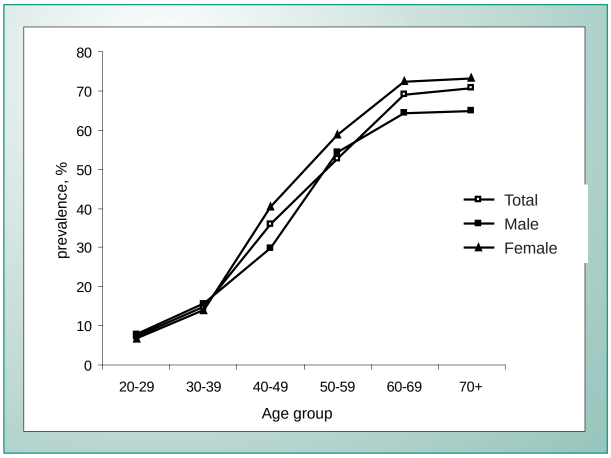

Fig. 1 - Prevalence of hypertension per age and gender. Salvador-Brazil.

They are observed mainly in studies based on household interviews, with examinations performed elsewhere in another date. Some examples are the recent studies by Wolf-Mayer et al, Cooper et al, and Victor et al[2,17,18]. Other authors analyze those who present themselves for examinations, but fail to mention rate losses.

Blood pressure measurement using electronic devices was recommended for epidemiological studies in the Americas by team consensus that included several participants of the "Joints"[14]. Once validated and approved, they replace the mercury sphygmomanometer, particularly when the latter is restricted, and are more suitable than aneroid sphygmomanometers, which are more prone to error[14]. Electronic devices are widely used and recommended by Cooper et al[19] for population surveys.

The cut-off points for waist circumference recommended internationally are controversial[20] and do not adapt to many populations, including that of Salvador. After preliminary analyses, we chose the criteria derived from the population studied[16].

These criteria are similar to those recently proposed for South American countries: 80 cm for women and 90 cm for men[21]. We believe that our results do not preclude the extrapolation of data to people from the predominant social levels in the study. The study sample took into account the proportion of social strata of the areas included, with a gap in not covering the highest social stratum.

The predominance of hypertension in women is consistent with the results of six other old national studies – two of them carried out in Bahia as well, two in Rio Grande do Sul, and two in Rio de Janeiro[11,22]. In the other Brazilian studies, men showed higher prevalence[11]. This result contrasts with most information from other countries, which report higher prevalence among men[2].Hypertension prevalence is similar in the United States and Canada, around 30.4% for men and 24.8% for women, while in six European countries it ranged from 44.8% to 60.2% among men and from 30.6% to 50,3% among women in the 35-74 age group[2]. However, there are also gender-related contradictions in the United States, with

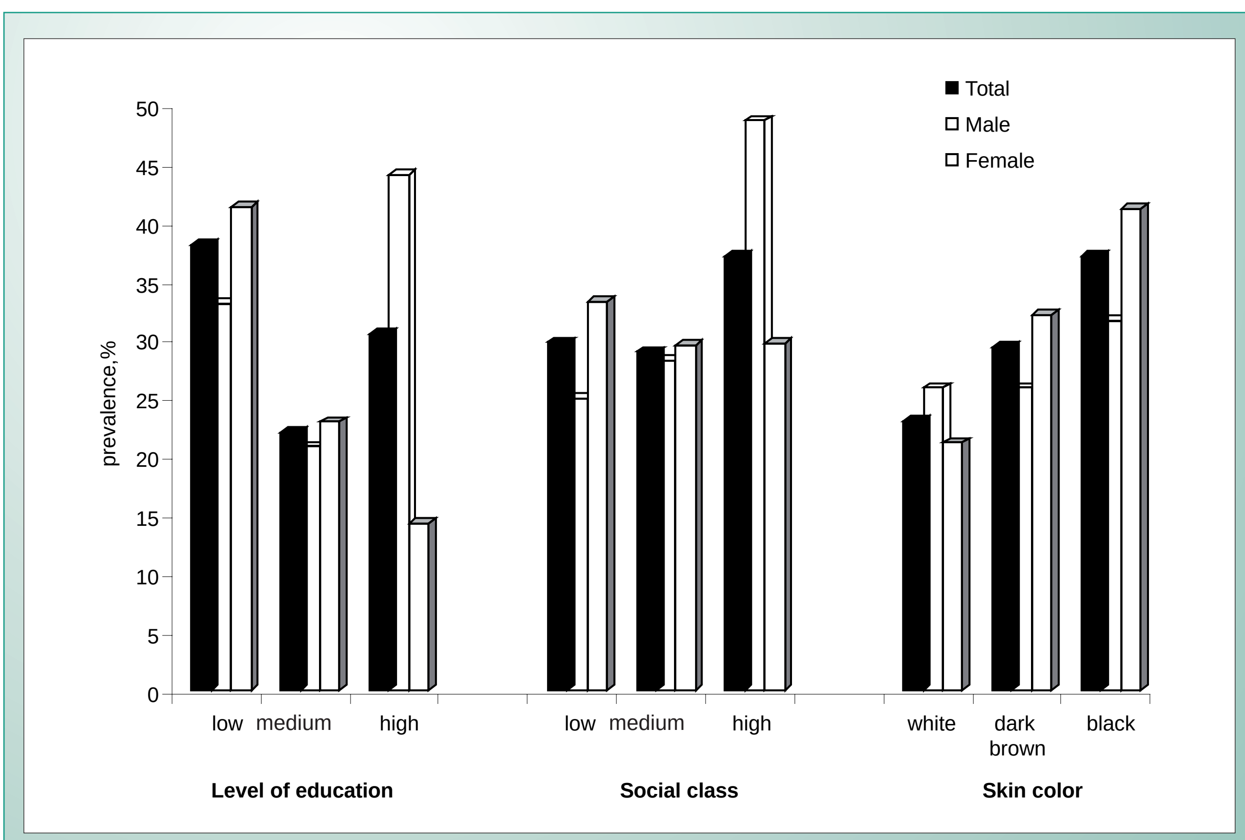

Fig. 2 - Prevalence of hypertension per skin color, schooling, and socioeconomic status. Salvador- Brazil.

	Gender				
	Male		Female		
Variables	N %	H prevalence and 95% CI	N %	H prevalence and 95%% CI	RP* F:M
Age (years)					
20-29	167 (27.4)	7.8 (3.7- 11.9)	180 (21.7)	6.7 (3.0- 10.4)	0.9
30-39	141 (23.2)	15.6 (9.6- 21.6)	230 (27.7)	13.9 (9.4- 18.4)	0.9
40-49	155 (25.4)	29.7 (22.5- 36.9)	198 (23.9)	40.4 (33.6- 47.2)	1.4**
50-59	81 (13.3)	54.3 (43.5- 65.1)	108 (13.0)	58,9 (49.6- 68.2)	1.1
60-69	45 (7.4)	64.4 (50.4- 78.4)	69 (8.3)	72.5 (62.0- 83.0)	1.1
70 and older	20 (3.3)	65.0 (44.1- 85.9)	45 (5.4)	73.3 (60.4- 86.2)	1.1
Race					
White	151 (24.8)	25.8 (18.8- 32.8)	218 (26.3)	21.1 (15.7- 26.5)	0.8
Dark brown	287 (47.1)	25.8 (20.7- 30.9)	381 (45.9)	32.0 (27.3- 36.7)	1.2
Black	171 (28.1)	31.6 (24.6- 38.6)	231 (27.8)	41.1 (34.8- 47.7)	1.3
Education level					
Low	272 (45.0)	33.0 (27.4- 38.6)	404 (48.8)	41.3 (36.5- 46.1)	1.3
Médium	307 (50.8)	20.8 (16.3- 25.3)	402 (48.6)	22.9 (18.8- 27.0)	1.1
High	25 (4.1)	44.0 (24.5- 63.5)	21 (2,5)	14,3 (-0.7- 29.3)	0.3***
Social class					
Low	365 (59.9)	24.9 (20.5- 29.3)	488 (58.8)	33.2 (29.0- 37.4)	1.3
Médium	209 (34.3)	28.2 (22.1- 34.3)	288 (34.7)	29.5 (24.2- 34.8)	1.0
High	35 (5.8)	48.6 (32.0- 62.5)	54 (6.5)	29.6 (17.4- 41.8)	0.6
Smoking					
Yes	164 (26.9)	26.8 (20.0- 33.6)	148 (17.8)	26.4 (19.3- 33.5)	1.0
No	445 (73.1)	27.6 (23.4- 31.8)	682 (82.2)	32.8 (29.3- 36.3)	1.2
Excessive alcohol consumption					
Yes	57 (9.4)	40.4 (27.7- 53.1)	13 (1.6)	38.5 (12.0- 65.0)	1.0
No	552 (90.6)	26.1 (22.4- 29.8)	817 (98.4)	31.6 (28.4- 34.8)	1.2
Physical activity					
Active	268 (44.0)	33.6 (27.9- 39.3)	598 (72.1)	34.1 (30.3- 37.9)	1.0
Sedentary	341 (66.0)	22.6 (18.2- 27.0)	231 (27.9)	25.5 (19.9- 31.1)	1.1
Overweight/obesity					
BMI ≥ 30	42 (6.9)	52.4 (37.3- 67.5)	153 (18.4)	58.2 (50.4- 66.0)	1.1
BMI ≥ 25 <30	165 (27.1)	39.4 (31.9- 46.9)	284 (34.2)	35.3 (29.7- 40.9)	0.9
BMI < 25	402 (66.0)	19.9 (16.0- 23.8)	393 (47.4)	18.6 (14.8- 22.4)	0.9
Central obesity					
Yes	203 (33.3)	45.3 (38.5- 52.1)	308 (37.1)	51.9 (46.3- 57.5)	1.1
No	406 (66.7)	18.5 (14.7- 22.3)	522 (62.9)	19.7 (16.3- 23.1)	1.1
Diabetes					
Yes	40 (6.6)	55.0 (39.6- 70.4)	80 (9.6)	72.5 (62.7- 82.3)	1.3
No	569 (93.4)	25.5 (21.9- 29.1)	750 (90.4)	27.3 (24.1- 30.5)	1.1

*Mean age: white women = 41.7 ± 15.97; black women = 42.1 ± 14.26, p>0.05; white men = 39.9 ± 25.6; black men = 40.8 ± 12.93 (t = 0.40, p > 0.05); P values: a) < 0.030; b)< 0.000; c) <0.017; d) < 0.004; e) < 0.003; f) < 0.024*RP :F/M = ratio of proportions, female/male; ** p < 0.05; *** p < 0,01; § p < 0.001.*

Table 2 - Arterial hypertension (H) prevalence and 95% confidence intervals (CI), Salvador- Brazil

	Gender				
	Male		Female		
Variables	N %	H prevalence and 95% CI	N %	H prevalence and 95%% CI	RP* F:M
Cholesterol					
>240 mg/dL	164 (26.9)	37.2 (29.8- 44.6)	287 (34.6)	47.4 (41.6- 53.2)	1.3
200-240 mg/dL	84 (13.8)	40.5 (30.0- 51.0)	129 (15.5)	37.2 (28.9 – 45.5)	0.9
< 200 mg/dL	361 (59.3)	19.9 (15.8- 24.0)	414 (49.9)	19.1 (15.9 –22.9)	1.0
HDL					
< 40 mg/dl	173 (28.4)	26.8(22.6- 31.0)	165 (19.9)	31.6 (28.1- 35.1)	1.2
≥ 40 mg/dL	436 (71.6)	28.9 (22.1- 35.7)	665 (80.1)	32.1 (25.0- 39.2)	1.1
LDL					
≥ 160 mg/dL	153 (25.6)	22.9 (19.0- 26.8)	290 (35.2)	22.1 (18.6- 25.6)	1.0
< 160 mg/dL	444 (71.4)	38.6 (30.9- 46.3)	533 (64.8)	48.3 (42.5- 54.1)	1.3§
Triglycerides					
≥ 200	96 (15.8)	37.5 (27.8- 47.2)	96 (11.6)	47.9 (37.9- 57.9)	1.3
<200	513 (84.2)	25.5 (21.7- 29.3)	734 (88.4)	29.6 (26.3- 32.9)	1.2
Menopause					
Yes	-	-	547 (65.9)	58.3 (52.3 – 64.1)	-
No	-	-	283 (34.1)	17.9 (14.8 – 21.4)	-

*Mean age: white women = 41.7 ± 15.97; black women = 42.1 ± 14.26, p>0.05; white men = 39.9 ± 25.6; black men = 40.8 ± 12.93 (t = 0.40, p > 0.05); P values: a) < 0.030; b)< 0.000; c) <0.017; d) < 0.004; e) < 0.003; f) < 0.024*RP :F/M = ratio of proportions, female/male; ** p < 0.05; *** p < 0,01; § p < 0.001.*

Cont. Table 2 - Arterial hypertension (H) prevalence and 95% confidence intervals (CI), Salvador- Brazil

a reported predominance of hypertension in women[10].

The approximately 28% of hypertension observed in men and 32% in women are consistent with those described in other Brazilian regions having ethnic, racial, and sociocultural characteristics different from other countries[11], including Latin American countries[3-5,23,24].

The many ethnic groups that make up Brazilian racial formation do not allow an unbiased racial classification. The Brazilian Institute of Geography and Statistics, IBGE, uses the term "self-definition of skin color" in its demographic censuses. Although it is not an ideal criterion, it has been used in epidemiological studies and was recently validated in Rio de Janeiro (Brazil), with Kappa > 80%[25]. In the analyzed data, sample distribution of skin color/ethnicity did not differ of that presented in the last demographic census of Salvador. Thus, by self-definition of skin color, adjusted for age and other covariables analyzed, prevalence of hypertension in women showed a growing gradient, from whites to blacks, with a statistically significant OR for dark brown and black women. Apart from Araraquara, SP[26], all Brazilian studies including race reported higher prevalence of hypertension among blacks [27]; however, in Salvador, prevalence ratios among blacks and whites were lower than in other regions of Brasil[11], reflecting the marked racial miscegenation of the population.

In the American and Jamaican black population between 35 and 64 years of age, age-adjusted prevalence of hypertension was also reported to be higher in women than in men (44.8% *vs.* 43.1% and 31.8% *vs.* 23.4%, respectively), but it was lower and similar among Nigerian men and women (13.9% *vs.* 13.1%) living the rural areas of their own country[17]. In this same study, all prevalences found in populations of European descent were higher in men, and in all countries were greater than that of African-americans, while the high prevalence of hypertension of African-american women was similar to that of Spanish women and outnumbered only that of the German women[17]. Noting that the women studied in Salvador were older than those of the study mentioned above, and their ages were standardized with those of American women, hypertension prevalence found in Brazilian black women is similar to that of their American counterparts.

The analysis of hypertension prevalence and treatment in African-american men, stratified by very low, low, and moderately low socioeconomic status, showed that hypertension is highly prevalent in the three groups, associated only with age, level of education, and BMI, but underscoring obesity in the lowest status[28]. The author of this study emphasized the intraracial divergence unfavorable to blacks in the group belonging to the very low social status. In all Brazilian studies hypertension predominates in low education level strata[11], regarded as a parameter of low social status. However, in this study this occurred only for women, with a clear linear decline from low to high level of education, and from low to medium and high social status, even though the ORs lost their statistical significance after the adjustments. The opposite was

Characteristics	Gender			
	Male		Female	
Age (years)	**UOR (95% CI)**	**AOR (95% CI)**	**UOR (95% CI)**	**AOR (95% CI)**
20-29	1.0	1.0	1.0	
30-39	2.90 (1.05-4.52)	NS	2.26 (1.12-4.8)	2.04 (0.99-4.190)[b]
40-49	4.99 (2.75-9.69)	2.81 (1.05-2.94)[a]	9.46 (4.95-18.19)	5.77 (2.91-11.43)[a]
50-59	14.08 (6.89-28.80)	8.25 94.78-15.18)[a]	15.07 (7.51-30.26)	5.41 (2.34-12.51)[a]
60-69	21.47 (9.34-49.36)	12.90 (6.23-26.66)[a]	36.84 (16.74-1.06)	12.79 (4.98-32.81)[a]
70 and older	22.00 (7.47-64.73)	16.29 (5.96-45.50)[a]	38.5 (15.90-93.09)	14.37 (5.09-40.52)[a]
Race				
White	1.0		1.0	1.0
Dark brown	0.99 (0.63-1.56)	Excluded	1.76 (1.19-2.60)	2.00 (1.25-3.19)[c]
Black	1.32 (0.81-2.15)	Excluded	2.61 (1.72-3.97)	2.93 (1.76-4.87)[a]
Education level				
Low	1.87 (1.29-2.72)	NS	4.22 (1.22-14.58)	NS
Medium	1.0	1.0	1.78 (0.51-6.18)	Excluded
High	2.98 (1.29-6.88)	2.92 (1.32-6.46)[d]	1.0	
Social class				
Low	1.0		1.18 (0.86-1.63)	Excluded
Medium	1.18 (0.81- 1.75)	Excluded	1.0	
High	2.84 (1.40-5.74)	NS	1.01 (0.53-1.90)	Excluded
Excessive alcohol consumption				
Yes	1.91 (1.09-3.36)	NS	1.35 (0.43-4.17)	Excluded
No	1.0		1.0	
Physical activity				
Active	1.73 (1.21-2.48)	NS	1.50 (1.07-2.12)	NS
Sedentary	1.0		1.0	
Overweight / obesity				
BMI ≥ 25	2.92 (2.01-4.22)	2.37 (1.57-3.60)[a]	3.37 (2.45-4.62)	1.62 (1.02-2.58)
BMI < 25	1.0	1.0	1.0	1.0
Central obesity				
Yes	3.66 (2.51-5.31)	NS	4.39 (3.22-5.99)	2.05 (1.31-3.21)
No	1.0		1.0	1.0
Diabetes				
Yes	3.57 (1.86-6.85)	NS	7.00 (4.18-11.74)	2.16 (1.19-3.93)
No	1.0		1.0	1.0
Cholesterol				
>240 mg/dL	1.89 (1.29-2.78)	NS	2.95 (2.17-4.00)	NS
< 240 mg/dL	1.0		1.0	
LDL				
≥ 160 mg/dL	2.10 (1.42-3.11)	NS	3.28 (2.41-4.47)	NS
< 160 mg/dL	1.0		1.0	
Triglycerides				
≥ 200	1.74 (1.10-2.77)	NS	2.19 (1.42-3.37)	NS
<200	1.0		Reference	
Menopause				
Yes			6.40 (4.64-8.83)	2.10 (1.23-3.57)
No			1.0	1.0

NS= non-significant; a) p =0.000- b) p =0.052- c) p = 0.003-d) p = 0.008- e) p = 0.042- f) p = 0.002- g) p = 0.006.

Table 3 - Arterial hypertension (H) prevalence and 95% confidence intervals (CI), Salvador- Brazil

true in males, differing from that reported in national studies[27]. Disparities in risk factors between races/ethnic groups and between genders are common in the Unites States[29].

An important contribution of epidemiological studies on arterial hypertension is the demonstration that it occurs in conjunction with other metabolic factors[30].This has already been observed in a study about the simultaneous nature of cardiovascular risk factors in Salvador[31] and is common in metabolic syndrome studies[32]. In this study, the association of hypertension with other cardiovascular risk factors occurred with sedentariness, obesity or overweight, central obesity, diabetes or hyperglycemia, and dyslipidemias, although the statistical significance of several of them was lost in the final model of the analysis. Not always was there concordance between men and women regarding factors that remained associated with H, despite the same social origin. Dyslipidemias aggravate hypertension and are part of the epidemiology of cardiovascular complications of H, but are not a risk factor.

In the female gender, and in keeping with the literature, positive and significant associations of H were found with black ethnicity, diabetes, overweight, central obesity and menopause, in addition to age ≥ 40 and dark brown complexion.

Among the contrasts found in the male gender compared to those reported in the literature were greater prevalence of hypertension in subjects with high level of education (statistically significant) and belonging to the high social status (non-significant). These social characteristics are common in groups of the elites, that is, the white groups. Nevertheless, social class and high level of education were underrepresented in the sample, as demonstrated by the small number of participants included in these two categories, with wide confidence intervals of the respective prevalence.On the other hand, 11.7% of black and 10.6% of white men were ≥ 60 years ($p < 0.05$), and the mean age of white and black were similar ($p > 0,05$). Consequently, there are no grounds for saying that there was a survival bias farorable to white men. Although significant associations between H and black race, central obesity and diabetes were expected for the male gender, they were not detected. Among the expected associations, only that of overweight/obesity was found.

Social stressors, particularly violence, common in the poorest neighborhoods, were not addressed in this study, but they may be an important social determinant associated with H in Salvador, considering the characteristics of the population studied.

Menopause and older age are biological risk factors associated with hypertension and other cardiovascular risk factors, such as central obesity and dyslipidemias, and are common in all epidemiological studies analyzing these variables.There may be an interaction with central obesity, common in women as they become older. Interactions were not analyzed because, as already mentioned, this was not a study with a hypothesis to be tested.

This is one of the few Brazilian studies in which hypertensive women predominated. Our results confirm the important role of hypertension in the population and show high prevalence of hypertension in blacks, especially black women. They also suggestthe need for deeper investigation among black people, review of the official strategies for detection, management, and control of hypertension, and massive, ongoing and properly designed educational interventions, in addition to those beginning at early ages.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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