Original Article

Complications of Hypertension in Men and Women Seen in a Referral Outpatient Care Unit

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Objective

To assess the association between sex and left ventricular hypertrophy, stroke, and renal failure in hypertensive patients in a referral outpatient care unit.

Methods

This study assessed 622 hypertensive patients diagnosed with left ventricular hypertrophy based on electrocardiography, renal failure based on serum creatinine level ≥ 1.4 mg/dL, and stroke based on a previous history and physical examination. Logistic regression was used to estimate the odds ratio of the association between sex and target-organ lesions in hypertension adjusted for race, age, and duration of the disease.

Results

The mean age of the patients was 48.4±13.8 years; 74.1% were women, and 84.9% were mulattos or blacks. Almost half of the men and more than 40% of the women had had at least 1 definite event involving a target-organ lesion. The incidence of renal failure was greater among men [adjusted OR (ORa) = 2.73, P= 0.002]. In white patients, the incidence of stroke was significantly (P= 0.017) greater among men (4/33) than among women (0/56), and, in the age group ≥ 49 years, the prevalence of left ventricular hypertrophy was significantly greater among men (ORa = 1.99, P= 0.024).

Conclusion

The data obtained suggest a greater prevalence of renal failure in men than in women, of stroke in white men than in white women, and of left ventricular hypertrophy in men than in women aged 49 years and above.

Keywords

sex, arterial hypertension

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Usually, the risk of the complications of arterial hypertension is greater in men than in women [1]. In elderly groups, this difference between sexes is reduced, particularly the risk of cardiovascular complications, which is strikingly increased in women after menopause [2,3]. In addition to age, race should also be considered in comparing men and women in regard to adverse events in arterial hypertension. In the United States, the risk of end-stage renal disease attributed to hypertensive nephropathy, for example, is greater in black than in white individuals, and in men than in women [4-6]. In the age group from 20 to 50 years, the risk of end-stage renal disease due to arterial hypertension is 30% greater in men than in women, and the differences between sexes are similar in black and white individuals [4]. These differences between sexes tend to increase in more advanced age groups in white individuals and to decrease in black individuals, due to the increased incidence of end-stage renal failure due to arterial hypertension in elderly black women.

It is not clear whether the differences between men and women reported in community epidemiological studies reflect what happens in patients seeking medical care. In addition to the prevalence and severity of the problem, social and demographic factors, such as sex, race, and age, have behaved as mediators of the patients' demand for prevention and treatment services [7,8]. Barriers to accessing health care, as well as the awareness level about the severity of the problem and the control measures, may play important roles in the prevalence of complications of chronic diseases, such as arterial hypertension, observed in certain social and demographic groups assessed in outpatient clinics or hospitals [8-10].

This study aimed at assessing whether sex was associated with left ventricular hypertrophy, stroke, and renal failure in hypertensive patients seen at referral outpatient clinics.

Methods

A cross-sectional study using data of 622 hypertensive patients admitted to a referral outpatient care clinic for arterial hypertension from August 1982 to July 1986. The assessment of patients included anamnesis, physical examination, electrocardiography, and routine laboratory tests.

Ultrasound of the urinary system, chest X-ray in the postero-anterior projection, excretory urography, selective renal arteriography, plus additional laboratory tests, such as quantitative proteinuria and renal biopsy, were performed in patients suspected of having secondary arterial hypertension. The following diagnoses were established: 10 patients with glomerulopathies, 7 patients

with renal artery disease, 1 patient with polycystic kidneys, and 1 patient with iatrogenic Cushing's syndrome.

Blood pressure was measured through the auscultatory method in the right arm in 3 positions (lying down, sitting, and standing up), with 2-minute intervals between the measurements. A mercury-column sphygmomanometer and 12cm-width and 23cm-length adult cuffs were used. The cuff was inflated up to 30 mmHg above the systolic blood pressure level previously measured using the auscultatory method and was slowly deflated at a velocity of 2 to 3 mmHg per second. Systolic blood pressure was determined by the auscultation of the first continuous sound (phase I of the Korotkoff sounds), and diastolic blood pressure was determined by the disappearance of the sound (phase V). Systolic and diastolic blood pressures used in the analysis were determined by using the means of the 3 initial measurements. Patients with systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg, or both, or patients receiving antihypertensive medication were considered hypertensive. In regard to severity, arterial hypertension was classified as mild, moderate, and severe, according to the classification used at the time of data collection [11]. The patients who already had target-organ lesions were considered severely ill, independent of their blood pressure levels. Accelerated or malignant arterial hypertension was defined on funduscopy in the presence of retinal hemorrhages or exudates, or papilledema.

The complications of arterial hypertension were assessed by using clinical examination and complementary tests. The diagnosis of left ventricular hypertrophy was based on electrocardiographic criteria (Sokolow-Lyon voltage criteria). Stroke was identified through the history of a previous event, such as a transient ischemic event, or its sequela, through physical examination. Patients with serum creatinine levels ≥1.4 mg/dL were considered to have renal failure. Patients with a history of a parent, grandparent, or sibling with arterial hypertension were considered to have a positive familial history. The duration of arterial hypertension diagnosed was classified into the 3 following levels: < 1 year; ≥1 and < 10 years; and ≥10 years. The patients were also classified according to their origin as follows: coming from the capital of the state of Bahia (Salvador city), from the inner area of the state of Bahia, and from another state. According to the Krieger [12] classification of race modified by Azevedo [13], the patients were divided into white, mulatto, and black.

The *t* test for independent samples was used to compare the mean ages, and the chi-square test or Fisher exact test was used to compare variables represented by proportions. Multiple logistic regression was used to estimate the odds ratio (OR) of the association between sex and each type of target-organ lesion. The OR was adjusted for sex, race (2 dichotomous indicator variables, 1 to identify the mulattos and another to identify the blacks), age (as a continuous variable), and duration of arterial hypertension (3 categories). The Breslow-Day homogeneity test was used for detecting statistically significant variations in the OR of the association of sex and target-organ lesion in 2 racial groups (the group of white patients and the group that comprised black and mulatto patients) and in the 2 age groups (< 49 and ≥49 years). The Statistical Package for Social Science software (SPSS), version 10.0 for Windows, was used for comparisons between 2 groups and for multiple logistic regression [14,15]. The Exact2K module of the Computer Programs for Epidemiologists, version 3, was used for the Fisher exact test when 1 of the variables was classified into more than 2 levels [16]. The Casecont module of that same software was used for estimating OR and the respective 95% confidence interval (CI) in one of the tables with a zero value cell (0) [16]. For calculating OR in this specific situation, 0.5 was added to each cell.

Results

The sample comprised 461 (74.1%) women and 161 (25.9%) men, whose mean ages (around 48.5 years) were similar in both groups (tab. I). The median age was 48 years in the general and

Table I - Characteristics of the patients

Characteristics	Men n=161	Women n=461	P Value	Total n=622
Age (mean ± SD)*	48.5±15.7	48.4±13.1	0.930	48.4±13.8
Origin				
Salvador city	84.5 (136)	85.7 (395)	0.879	85.4 (531)
Inner state	14.9 (24)	13.4 (62)		13.8 (86)
Other state	0.6 (1)	0.9 (4)		0.8 (5)
Familial history of AH	53.4 (86)	58.4 (269)	0.553	57.1 (355)
Race				
White	21.1 (34)	13.0 (60)	0.021	15.1 (94)
Mulatto	65.0 (104)	66.4 (306)		65.9 (410)
Black	14.3 (23)	20.6 (95)		19.0 (118)
Secondary AH†	3.1 (5)	3.1 (14)	1.000	3.1 (19)
Duration of AH (years)‡				
< 1	37.5 (57)	23.6 (106)	0.004	27.1 (163)
1 to < 10	42.8 (65)	53.0 (238)		50.4 (303)
≥ 10	19.7 (30)	23.4 (105)		22.5 (135)
Severity of AH§				
Mild	29.3 (46)	33.5 (153)	0.492	32.4 (199)
Moderate	19.7 (31)	18.3 (84)		18.7 (115)
Severe	47.2 (74)	46.2 (211)		46.4 (285)
Accelerated/malignant	3.8 (6)	2.0 (9)		2.4 (15)
Use of antihypertensive drugs	73.9 (119)	80.9 (373)	0.060	79.1 (492)

* Except for age, the other results are represented as % (absolute number); † lack of data for 2 men and 2 women; ‡ lack of data for 9 men and 12 women; § lack of data for 4 men and 4 women.

female groups and 49 years in the male group. No statistically significant difference was observed between the sexes in regard to the secondary forms of arterial hypertension, the severity of disease, the use of antihypertensive drugs, the patient's origin, and the familial history. A greater incidence of women (20.6%) was observed as compared with that of men (14.3%), and a statistically significant difference was observed in the racial distribution between sexes (P= 0.021). A greater incidence of hypertensive individuals diagnosed for at least 1 year (P= 0.004) was observed, as was a tendency towards a greater incidence of the use of antihypertensive drugs (P= 0.06) in women as compared with that in men.

Different classes of antihypertensive drugs were used according to the economic status of the patients, the indication, and the therapeutic response to medications. However, the most frequently used antihypertensive drugs were those available in the public health system.

Approximately 47.2% of men and 42.3% of women had at least 1 of the complications of arterial hypertension considered in the present study (renal failure, stroke, left ventricular hypertrophy). The results of the associations between sex and the specific type of target-organ lesion are shown in table II. The relation between the number of patients with and without renal failure, both in the nonadjusted and adjusted analysis, was 2.7 times greater in men than in women (ORa = 2.73; 95% CI= 1.46-5.08; P= 0.002). In the total sample, no statistically significant difference between sexes was observed in regard to stroke and left ventricular hypertrophy.

The prevalence of stroke was significantly (P= 0.017) greater among white men (4/33) than among white women (0/56). White men had a greater frequency of renal failure and left ventricular hypertrophy than white women did. Differences between the sexes were not statistically significant (tab. III).

Similarly to that observed in the general group, in the group of patients classified as mulattos or blacks, the incidence of renal failure was significantly greater among men than among women (ORa = 2.63; 95%CI = 1.34-5.16; P= 0.005). Among blacks, sex did not associate in a statistically significant manner with stroke and left ventricular hypertrophy.

Male patients aged less than 49 years had a lower incidence of

Table II - Odds ratio of the association between sex and target-organ lesion

		OR (95% CI); P value	
	% (n/N)	Nonadjusted	Adjusted*
Stroke			
Men	15.4 (23/149)	1.40 (0.82-2.38), p=0.217	1.53 (0.86-2.74), p=0.148
Women	11.6 (51/441)	Reference=1	Reference=1
Left ventricular hypertrophy			
Men	39.9 (57/143)	1.00 (0.68-1.48), p=0.999	1.22 (0.80-1.77), p=0.363
Women	39.8 (163/409)	Reference=1	Reference=1
Renal failure			
Men	14.7 (22/150)	2.74 (1.50-4.99), p=0.001	2.73 (1.46-5.08), p=0.002
Women	5.9 (26/440)	Reference=1	Reference=1

OR- odds ratio; CI- confidence interval.

Table III - Odds ratio of the association between sex and target-organ lesions according to race

		OR (95%CI); P value	
	% (n/N)	Nonadjusted	Adjusted
A. White individuals			
Stroke			
Men	12.1 (4/33)	17.24 (1.61-infinite)*, p=0.017	†
Women	0.0 (0/56)	reference=1	
Left ventricular hypertrophy			
Men	42.4 (14/33)	1.36 (0.56-3.30), p=0.500	1.54 (0.59-4.04), p=0.371
Women	35.2 (19/54)	reference=1	reference=1
Renal failure			
Men	11.8 (4/34)	3.53 (0.61-20.44), p=0.137	3.24 (0.54-19.47), p=0.199
Women	3.6 (2/55)	reference=1	reference=1
B. mulattos/blacks			
Stroke			
Men	16.4 (19/116)	1.28 (0.72-2.28), p=0.394	1.27 (0.68-2.36), p=0.453
Women	13.2 (51/385)	reference=1	reference=1
Left ventricular hypertrophy			
Men	39.1 (43/110)	0.94 (0.61-1.46), p=0.783	1.14 (0.71-1.84), p=0.591
Women	40.6 (144/355)	reference=1	reference=1
Renal failure			
Men	15.5 (18/116)	2.76 (1.44-5.29), p=0.002	2.63 (1.34-5.16), p=0.005
Women	6.2 (24/385)	reference=1	reference=1

*To determine the nonadjusted odds ratio and respective 95% confidence interval. 0.5 was added to each cell; † the logistic model became unstable partially due to the lack of cases of stroke in white women; OR- odds ratio; CI- confidence interval.

left ventricular hypertrophy, but a greater incidence of stroke and renal failure. None of these differences observed in the age group < 49 years, however, reached statistical significance (P > 0.05).

Contrary to that observed in the age group < 49 years, in the age group ≥ 49 years, the adjusted prevalence of left ventricular hypertrophy was significantly greater in men than in women (ORa = 1.99; 95%CI = 1.09-3.61; P= 0.024), and the prevalence of renal failure was also significantly greater in men than in women. Following the pattern observed in the whole sample, the prevalence of stroke was greater in men, but had no statistical significance.

Table IV shows the P values of the homogeneity tests of the odds ratio of the association between sex and each target-organ lesion in both racial groups (white versus mulatto+black) and in both age groups (< 49 versus ≥49 years). The homogeneity tests revealed that the variation in the odds ratio of the association between sex and stroke in the racial groups shown in table III was statistically significant (P= 0.024). Similarly, the odds ratio of the association between sex and left ventricular hypertrophy shown in table V varied significantly between the age groups (P= 0.024).

Discussion

In the present study, most of the sample was composed of women, who accounted for more than 70% of the patients studied. In addition, at the time of the initial medical visit, women used antihypertensive drugs more frequently and had their diagnosis of arterial hypertension established for a longer time than the men did. The greater awareness level of women in regard to health care and their greater adherence to treatment as compared with that of men is noteworthy.

Almost half of the men and more than 40% of the women already had at least 1 of the complications of arterial hypertension considered in the present study. In the general group, a statistically significant difference between men and women was observed in regard to renal failure in blacks and individuals aged ≥49 years. The prevalence of patients who had, at their first medical visit, a serum creatinine level ≥1.4 mg/dL was almost 3 times greater in men than in women after adjusting for age and race. The stratified analysis for age group showed that the result in the general group was mainly due to the strong association between sex and creatinine level in patients aged ≥49 years. The greater volume of muscle mass in men may have contributed to the strong association between sex and elevated serum creatinine levels. The findings, however, are in accordance with the greater risk of chronic renal failure for men, mainly end-stage renal disease due to hypertensive nephropathy [5, 6]. In addition to male sex, advanced age and black race are risk factors for chronic renal failure and end-stage renal disease due to hypertensive nephropathy [5,6,17-23]. It is important to assess whether the greater prevalence of undiagnosed arterial hypertension, or the lower adherence to antihypertensive treatment, or both, may explain the greater prevalence of renal failure and end-stage renal disease due to hypertensive nephropathy in the men than in the women in our sample.

Contrary to that observed for renal failure, sex was not associated in a statistically significant manner with the prevalence of stroke and left ventricular hypertrophy in the general group. When stratifying the sample according to age and racial groups, however, differences between the sexes were observed in regard to stroke and left ventricular hypertrophy, respectively. In the group of white patients, all strokes detected occurred in men. Contrary to that found in the analysis of the general group, the association between

Table IV - P values of the homogeneity (Breslow-Day) tests of the odds ratio of the association between sex and target-organ lesion in 2 racial groups and 2 age groups

Target-organ lesions	Groups	
	Race: (White vs Black+Mulatto)	Age: (<49 vs ≥49 years)
Stroke	0.024	0.970
Left ventricular hypertrophy	0.467	0.024
Renal failure	0.796	0.126

Table V - Odds ratios of the association between sex and target-organ lesions according to age groups

		OR (95% CI); P value	
	% (n/N)	Nonadjusted	Adjusted
A. Age < 49 years			
Stroke			
Men	15.5 (11/71)	1.38 (0.65-2.96), p-0.404	1.56 (0.68-3.59), p=0.295
Women	11.7 (26/222)	reference=1	reference=1
Left ventricular hypertrophy			
Men	23.2 (16/69)	0.58 (0.31-1.09), p=0.090	0.64 (0.35-1.31), p=0.246
Women	34.2 (69/202)	reference=1	reference=1
Renal failure			
Men	14.1 (10/71)	1.82 (0.80-4.15), p=0.149	1.46 (0.61-3.52), p=0.396
Women	8.3 (18/218)	reference=1	reference=1
B. Age ≥ 49 years			
Stroke			
Men	15.4 (12/78)	1.41 (0.67-2.97), p=0.140	1.44 (0.65-3.33), p=0.361
Women	11.4 (25/219)	reference=1	reference=1
Left ventricular hypertrophy			
Men	55.4 (41/74)	1.49 (0.88-2.55), p=0.140	1.99 (1.09-3.61), p=0.024
Women	45.4 (94/207)	reference=1	reference=1
Renal failure			
Men	15.2 (12/79)	4.79 (1.88-12.21), p<0.001	5.22 (1.98-13.75), p<0.001
Women	3.6 (8/222)	reference=1	reference=1

OR- odds ratio; CI- confidence interval

sex and stroke was statistically significant when analyzing the specific group of white patients. Unfortunately, in the subgroup of white patients, the adjusted odds ratio for age could not be obtained through logistic regression. It is worth noting, however, that the mean age and duration of hypertension among white men with stroke did not significantly differ from the values observed among white women. Therefore, age and duration of arterial hypertension are unlikely to explain the differences in the prevalence of stroke among white men and women. In the group of blacks and mulattos, the prevalences of stroke in men and women were much closer compared with those reported for the group of white patients. In addition, the prevalence of stroke was significantly greater in black women compared with that in white women.

A significantly greater prevalence of left ventricular hypertrophy was observed in men than in women aged ≥49 years after adjusting for race and duration of arterial hypertension. This difference observed between the sexes in the age group ≥49 years has clinical importance, considering that left ventricular mass and left ventricular hypertrophy are important risk factors for fatal cardiovascular events [24-26].

The results concerning the relation between sex and target-organ lesion in arterial hypertension reported in our study can be potentially generalized to other groups of patients being followed up on an outpatient basis, particularly in a referral outpatient care clinic. One of the limitations of the study lies in the fact that it was carried out in the 1980s; however, the characteristics of the population currently being treated in our service may be similar, because the service continues to be a referral center for the treatment of hypertension in the state of Bahia. However, such results apply to the population of the study and are part of the components of the service. The data alert one to the possible influence of the racial composition of the patients and their ages in the comparisons between men and women in regard to target-organ lesions in arterial hypertension. It is also worth noting that the extension of the problem in the general population influences the prevalence of the events observed in the outpatient follow-up. Survival of the patients, the obstacles to accessing health care services, and aspects of behavior determining a spontaneous search for preventive or curative measures are factors that may influence the prevalence of complications of arterial hypertension in target organs in patients assessed on an outpatient care basis. In Brazil, arterial hypertension along with diabetes mellitus is 1 of the major causes of death, an important risk factor for cardiovascular diseases and end-stage renal disease [27]. However, our population is poorly informed about the risks of arterial hypertension and its rates remain elevated [28]. In addition, physicians frequently do not alert hypertensive patients to the need for losing weight, exercising, and quitting smoking [9], and, therefore, the risk factors are detected for the first time at the emergency department, due to complications of the disease, such as hypertensive encephalopathy, heart failure, stroke, renal failure, and ischemic coronary events. The late diagnosis and inadequate control of arterial hypertension may have contributed to the elevated frequency of complications observed in men and women in our study.

In conclusion, the prevalence of renal failure was significantly greater in men than in women with arterial hypertension assessed on an outpatient care basis. The differences between sexes in regard to the prevalence of renal failure were even more striking in patients aged >49 years. The prevalence of stroke was significantly greater among white men than among white women. Interventions aiming at an earlier diagnosis of arterial hypertension and improvement in the access of patients to health care aiming at adequate control of blood pressure may contribute to reducing the risk of complications in target organs in men and women of different age and racial groups.

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