Original Article

Prevalence, Awareness, and Control of Systemic Arterial Hypertension in the State of Rio Grande do Sul

Iseu Gus, Erno Harzheim, Cláudio Zaslavsky, Cláudio Medina, Miguel Gus

Porto Alegre, RS - Brazil

Objective

To report the prevalence of cardiovascular risk factors, particularly of systemic arterial hypertension, in the adult population of the Brazilian state of Rio Grande do Sul, in addition to the public's level of awareness, hypertensive control, and associated factors.

Methods

A cross-sectional, population-based study with random sampling from a population pool was carried out with 918 patients older than 20 years from 1999 to 2000. Systemic arterial hypertension was defined as blood pressure ≥ 140/90 or current use of antihypertensive drugs.

Results

The prevalence of systemic arterial hypertension was 33.7% (n=309), and 49.2% of the individuals were unaware of their hypertensive condition; 10.4% knew they were hypertensive, but did not undergo treatment; 30.1% underwent antihypertensive treatment, but did not have adequate control; and 10.4% underwent antihypertensive treatment with adequate control. Based on multivariate analysis, the following variables were found to be significantly associated with the presence of systemic arterial hypertension: age (OR=1.06), obesity (OR=3.03), and low educational level (OR=1.82). These same variables were associated with unawareness of the hypertensive condition: age (OR=1.05), obesity (OR=2.46), and low educational level (OR=2.17).

Conclusion

Prevalence of systemic arterial hypertension in the state of Rio Grande do Sul has been remained at constant levels for the past decades, and the population's level of awareness of it has improved slightly. However, the control level of systemic arterial hypertension has not increased. This study allowed the definition of a target group – elderly, obese individuals with low educational level – for both diagnostic campaigns and better control of blood pressure levels.

Key words

epidemiology, cardiovascular diseases, hypertension

Cardiovascular diseases are the major cause of death in Brazil and accounted for 32% of all deaths in 1998. In the state of Rio Grande do Sul, the mortality rate due to diseases of the circulatory system in that same year was 235.70/100,000 inhabitants, representing the major cause of mortality, with 35.4% of the deaths in the state [1]. The state of Rio Grande do Sul, located in the extreme south of Brazil, occupied the best position in the human development index ranking among all Brazilian states, being considered the state with the best quality of life in 1996. Its population has 10 million inhabitants, and approximately 15% of them are older than 60 years. Its population, predominantly urban (78.7%), has an ethnic composition distinct from that in the rest of the country, resulting from German and Italian migration waves during the 19th century.

The demographic process of aging of our population, evidenced by the National Research through House Sampling (Pesquisa Nacional por Amostragem Domiciliar - PNAD) from 1997 to 1999 [2], implies a future increase in the incidence and prevalence of chronic - degenerative diseases, such as cardiovascular diseases. In 1990, more than half of the deaths occurring among the Brazilian elderly were caused by that group of diseases [3]. In this context, systemic arterial hypertension, due to its important role as a nonmodifiable cardiovascular risk factor [4-6], appears as 1 of the most important public health problems in our country, with its prevalence ranging from 10 to 42%, depending on the region, population subgroup, or diagnostic criteria used [7]. In addition, the scientific literature has plenty of substantial evidence, showing that preventive and therapeutic measures directed against systemic arterial hypertension reduce morbidity and mortality associated with cardiovascular diseases [8-16].

To understand the influence of systemic arterial hypertension on the development of cardiovascular diseases requires knowledge of its actual distribution in the different Brazilian states. During the years 1999 and 2000, the Instituto de Cardiologia of the Rio Grande do Sul and the State Secretariat of Health carried out a study on the prevalence of risk factors of coronary artery disease in the state of Rio Grande do Sul (Estudo da Prevalência dos Fatores de Risco da Doença Arterial Coronariana no Rio Grande do Sul) [17]. Through a representative sample of the population of the state, a database with varied information on coronary and cardiovascular risk factors was created. In the present study, analysis and interpretation of the data referring to systemic arterial hypertension were performed, aiming at determining its prevalence in the state of Rio Grande do Sul, describing the major characteristics associated with its recognition and control.

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Methods

An observational, analytical, cross-sectional population-based study was carried out in the state of Rio Grande do Sul. The database created for the original study to assess the prevalence of risk factors for coronary artery disease in the state of Rio Grande do Sul was used [17]. The sample with 1,066 individuals selected through a random sampling of a population pool was calculated by using the following parameters: 1) population size: infinite; 2) error (absolute accuracy): 3%; 3) prevalence expected: 50% (maximum variability); and 4) confidence level: 95%. To maintain the representativity of the urban population of the state of Rio Grande do Sul, the sample was distributed proportionally to the population of the main municipality of each of the 19 Centers of the State Secretariat of Health, representing all microregions of the state. This study was carried out from July 1999 to October 2000.

A structured questionnaire about the coronary risk factors (sedentary lifestyle, diabetes, smoking, systemic arterial hypertension, hypercholesterolemia) and sociodemographic characteristics was applied to all adults > 20 years old living in the selected dwellings. The individuals interviewed had their weight, height, and blood pressure levels measured by the interviewers, in addition to providing a blood sample after a 12-hour fasting period for measuring glycemia and total cholesterol. The blood sample was collected according to a standardized protocol 1 day after the interview and analyzed in the State Central Laboratory. Blood pressure was measured twice during the home visit at a minimum interval of 3 minutes, and the second measure was recorded. The interviewers, nurse technicians, and medical students were trained according to the guidelines of the World Health Organization for the appropriate measurement of blood pressure and for the appropriate completion of the questionnaire. All individuals selected for the study signed the written informed consent; only then was the questionnaire administered and the measurements taken.

The classification proposed by Burt et al [18] was used for analyzing the data referring to systemic arterial hypertension (chart I). Some data were also shown according to the old definition of systemic arterial hypertension, such as blood pressure level ≥ 160/95 mmHg, to allow comparison with previous studies performed in the state of Rio Grande do Sul[19-21]. This enabled comparison of the temporal evolution of the prevalence of systemic arterial hypertension in the state.

The Epi-Info 6.0 and SPSS 10.0 statistical software were used for data analysis. The results are shown as means and standard deviations or confidence intervals and their frequencies and proportions, depending on the type of each variable (continuous or categorical). Comparison between the variables was performed by using the chi-square test for the proportions and the t test for the means. Aiming at controlling the possible confounding biases between the variables analyzed, multivariate analysis was performed. The association between the characteristics studied and the systemic arterial hypertension classification groups was analyzed using a logistic regression model. For the construction of the final models, several partial models were constructed with the forward-conditional method, always controlling for age. The explicative variables selected in the partial models were then included in each final model presented.

Results

This study comprised 1,063 (48.2% of the male sex) individuals distributed throughout all the microregions of the state. The mean age in the entire sample was 44 ± 15.6 years, and 18% of the individuals were older than 60 years of age. Approximately 73% of the sample had a familial income ≤ 6 minimum wages, and 41% had a familial income ≤ 3 minimum wages. Approximately 41% of the individuals had not completed the fundamental educational level, having, therefore, less than 8 years of schooling, and 4.7% (50) of the individuals were illiterate. Comparing the demographic data of the sample with the preliminary data of the 2000 population census of the Brazilian Institute of Geography and Statistics (Censo Populacional de 2000 of the Instituto Brasileiro de Geografia e Estatística - IBGE) [22], the sample proved to be representative of the adult population of the state of Rio Grande do Sul. The mean body mass index was 26.3 kg/m^2 (± 4.8), and the proportion of smokers was 34%. The mean blood pressure was as follows: DBP, 81.4±11.8 mmHg; and SBP, 127.6±19.9 mmHg. Table I shows the major characteristics of the sample based on sex.

The prevalences of systemic arterial hypertension referring to the different classification criteria were 20.4% (187 individuals, CI=17.8-23.1%) for blood pressure ≥ 160/95 or lower if on antihypertensive drugs, and 33.7% (309 individuals, CI=30.6-36.8%) for blood pressure = 140/90 or lower if on antihypertensive drugs. As already defined in the methodology, the following results refer to the classification of systemic arterial hypertension according to Burt [18].

Nine hundred and eighteen individuals (86.3% of the entire sample) were classified according to their blood pressure status. When comparing the entire sample (n=1,063) with this subsample, statistically significant differences were found neither between their sociodemographic characteristics nor between their mean blood pressure levels. Of the 918 individuals, 609 (66.3%) were considered healthy in regard to the presence of systemic arterial hypertension; 33.7% (n=309) were classified as hyper-

Chart I – Criteria for the classification of hypertension.	
Category	Classification
Não hipertenso	PAS<140 mmHg e PAD<90, sem uso de anti-hipertensivo - without antihypertensive medication
Nonhypertensive	SBP<140 mmHg and DBP<90, no antihypertensive medication
Hypertensive	SBP ≥140 mmHg and/or DBP ≥90 or lower in individuals currently using antihypertensive medication
Hypertension present, but ignored	SBP ≥140 mmHg and/or DBP ≥90 in an individual unaware of his hypertensive condition
Hypertension known, but not treated	SBP ≥140 mmHg and/or DBP ≥90 in an individual aware of his hypertensive condition, but not on antihypertensive medication
Hypertension treated, but not controlled	SBP ≥140 mmHg and/or DBP ≥90 in an individual aware of his hypertensive condition and on antihypertensive medication
Hypertension treated and controlled	SBP<140 mmHg and DBP<90 in an individual aware of his hypertensive condition and on antihypertensive medication

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tensive, and 49.2% ignored their hypertensive condition; 10.4% knew they were hypertensive, but underwent no treatment; 30.1% underwent the antihypertensive treatment, but without adequate control (blood pressure < 140/90); and 10.4% of the individuals underwent antihypertensive treatment with adequate control (fig. 1). Considering systemic arterial hypertension as blood pressure ≥ 160/95 mmHg, the following was observed: 187 (20.4%) individuals were classified as hypertensive, 24.6% of whom ignored their hypertensive condition; 8.6% acknowledged being hypertensive, but underwent no treatment; 32.1% underwent antihypertensive treatment, but did not achieve adequate blood pressure control; and 34.7% underwent treatment and achieved adequate control (fig. 1).

Comparing the individuals classified as healthy with those classified as hypertensive, the following parameters showed a significant association with systemic arterial hypertension: advanced age, lower educational level, obesity, diabetes, hypercholesterolemia, and sedentary lifestyle (tab. II). On the other hand, the group of hypertensive individuals visited the health care services significantly more often and had a lower proportion of smokers.

The comparison between healthy individuals and hypertensive individuals unaware of their blood pressure status showed that advanced age, lower educational level, obesity, and sedentary lifestyle were significantly associated with unawareness of systemic arterial hypertension (tab. III).

Through multivariate analysis, age, presence of obesity (BMI ≥

30 kg/m²), and low educational level maintained an independent association with hypertension (tab. IV). Other variables included in the model (sex, presence of diabetes, familial income) did not have a significant association, and were excluded from the final model.

Using multivariate analysis to compare the individuals classified as healthy with the hypertensive ones who ignored their hypertensive condition, age, obesity, and low educational level maintained an independent association with unawareness of the hypertensive condition (tab. V).

In the group of individuals aware of their hypertensive condition (n=157), 125 (79.6%) did not have adequate blood pressure
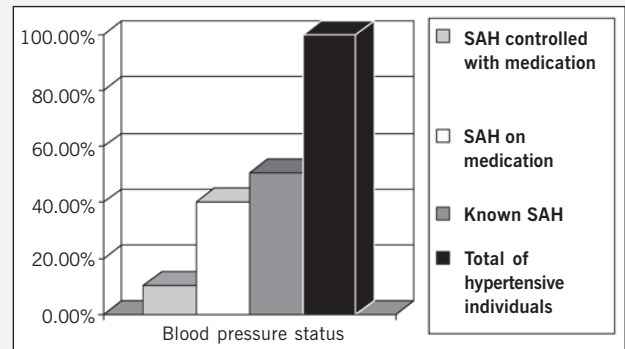

Fig. 1 - Distribution of the adult population of the state of Rio Grande do Sul according to the degree of awareness, treatment, and control of systemic arterial hypertension, 1999-2000.

Table I - Characteristics of the interviewees classified according to sex.			
Characteristics	Women	Men	p
Mean age (years)	44.8 (± 16)	43.4 (±15)	0.16
Proportion of individuals older than 60 years (%)	19.2%	16.4%	0.23
Illiterate (%)	4.5%	4.9%	0.79
Educational level < 8 years (%)	47.0%	36.1%	<0.001**
Familial income ≤ 3 minimum wages	46.2%	38.1%	<0.01**
Familial income ≤ 6 minimum wages	76.9%	71.4%	0.04
Mean body mass index (BMI, kg/m²)	26.2 (± 5.2)	26.4 (± 4.3)	0.48
Smoking (%)	29.6%	38.0%	<0.01**
Proportion of hypertensive individuals *	34.1%	33.3%	0.80
Mean blood pressure (mmHg)			
DBP	80.5 (± 12.6)	82.3 (± 11.0)	0.01**
SBP	126.6 (± 21.3)	128.7 (± 18.2)	0.09
Total	551	512	-

*BP ≥140/90 or lower in an individual on antihypertensive medication. ** Statistically significant differences. T test for the means and chi-square for the proportions.

Table II - Characteristics of the adult population of the state of Rio Grande do Sul classified as healthy or hypertensive, according to the classification of Burt, 1999-2000.			
Characteristics	Healthy (n=609)	Hypertensive (n=309)	p
Mean age (years)	39 (±13.6)	53 (±14.9)	<0.001
Age ≥ 60 years (%)	7.6%	35.3%	<0.001
Male sex (%)	50.4%	49.5%	0.80
Educational level < 8 years	30.1%	53.9%	<0.001
Familial income:			
≤ 3 minimum wages	39.0%	43.2%	0.25
≤ 6 minimum wages	71.8%	76.2%	0.16
Smoking (%)	36.0%	29.1%	0.04*
Visit to a health care service in the preceding year (%)	49.3%	61.1%	0.001
Mean body mass index (BMI - kg/m²)	25.1 (±4.2)	28.3 (±5.0)	<0.001
Obesity (BMI ≥30 kg/m²)	13.5%	34.9%	<0.001
Diabetes (fasting glycemia ≥ 126 mg/dL)	5.6%	9.6%	0.03
Hypercholesterolemia (cholesterol ≥200 mg/dL)	19.3%	38.4%	<0.001
Sedentary lifestyle	68.8%	77.3%	0.007
Mean blood pressure levels (mmHg)			
DBP	76 (±7.1)	91 (±12.5)	<0.001
SBP	117 (±9.8)	147 (±20.0)	<0.001

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Table III - Characteristics of the adult population of the state of Rio Grande do Sul classified as healthy or hypertensive unaware of their condition, 1999-2000.

Characteristics	Healthy (n=609)	Unaware of their hypertensive condition (n=152)	p
Mean age (years)	39 (±13.6)	51 (±14.5)	<0.001
Age ≥ 60 years (%)	7.6%	30.3%	<0.001
Male sex (%)	50.4%	59.3%	0.81
Educational level < 8 years	30.1%	55.6%	<0.001
Familial income			
≤ 6 minimum wages	71.8%	75.8%	0.33
Smoking (%)	36.0%	28.9%	0.10
Visit to a health care service in the preceding year (%)	49.3%	54.1%	0.30
Mean BMI (kg/m^2)	25.1 (±4.2)	27.7 (±4.7)	<0.001
Obesity (BMI ≥ 30 kg/m^2)	13.5%	30.0%	<0.001
Sedentary lifestyle	68.8%	80.8%	0.003

levels, and 32 (20.4%) had good blood pressure control (blood pressure < 140/90). Comparing these 2 groups, only the proportion of obese, greater in the noncontrolled group (44.7% versus 19.4%), reached a significant statistical difference (P=0.01). It is worth stressing that, in the group with controlled blood pressure, visits to public health services were more frequent (81.3% x 64.2%), although this difference was not statistically significant (P=0.067).

Discussion

Data presented in this article originated from a broader study whose major objectives were not the analysis of subgroups of hypertensive individuals. Therefore, as the sample was small in some of these subgroups, the possibility of type-b error in the distribution of some characteristics that had no statistical significance could not be excluded. Other important characteristics related to systemic arterial hypertension, such as familial history and alcohol consumption, were not assessed in the original study, hindering its analysis. On the other hand, these limitations do not decrease the importance of this study, which, repeating the pioneering experience of Achutti et al [19], describes the characteristics of the categories of hypertension in an entire Brazilian state, and not only in a metropolitan region.

Analyzing the results obtained, the prevalence of systemic arterial hypertension in the state of Rio Grande do Sul remains one of the major public health problems in the beginning of this century. This has been shown since the study by Achutti et al [19]

Table IV - Results of the logistic regression for the characteristics associated with hypertension in the adult population of the state of Rio Grande do Sul, 1999-2000.

Variables	Odds Ratio	p
Age	1.06 (1.05-1.07)	<0.001
BMI ≥ 30 kg/m^2	3.03 (2.10-4.38)	<0.001
Educational level < 8 years	1.89 (1.37-2.62)	<0.001

Table V - Results of the logistic regression for the characteristics associated with unawareness about the hypertensive condition of the adult population of the state of Rio Grande do Sul, 1999-2000.

Variables	Odds Ratio	p
Age	1.05 (1.04-1.06)	<0.001
BMI ≥ 30 kg/m^2	2.46 (1.56-3.88)	<0.001
Educational level < 8 years	2.17 (1.46-3.23)	<0.001

on the prevalence of the disease in the state of Rio Grande do Sul, and the study by Fuchs et al [20] in the capital of the state, the city of Porto Alegre. The results of the present study showed the maintenance of approximately 20% of hypertensive individuals when considering blood pressure levels = 160/95 mmHg in the adult population of the state. If blood pressure = 140/90 was the criterion for diagnosing arterial hypertension, its prevalence would exceed 30%. The analysis of the characteristics associated with systemic arterial hypertension through the model of logistic regression confirms the findings already described in other Brazilian studies [20-25] about the relation of age, obesity, and low educational level to blood pressure levels.

In this context, it is worth noting that an increase in the level of awareness of systemic arterial hypertension occurred when blood pressure levels ≥ 160/95 mmHg were considered, as approximately 75% of the hypertensive individuals interviewed recognized their condition, in comparison with the proportion of 57.7% observed in the city of Porto Alegre in 1994. In addition, the logistic regression analysis in the group of individuals who ignored their hypertensive condition points towards the existence of a target group for awareness campaigns and outpatient care characterized by older, obese individuals with a lower educational level.

On the other hand, the quality of systemic arterial hypertension control is alarming, because approximately 80% of the individuals aware of their hypertensive condition had blood pressure levels > 140/90 mmHg. Of the hypertensive individuals on antihypertensive medication (125), only 25.6% obtained blood pressure control. These results show that, in addition to the lack of awareness about the hypertensive condition, the effective control of the disease has not reached a satisfactory level, representing a challenge to be faced by the health system. New studies should focus on the identification of the causes of the failure of the antihypertensive treatment, approaching aspects, such as the lack of adherence to treatment, the difficulty of access to medication and medical services, the effectiveness of the therapeutic schemes used, the way the health professionals manage hypertensive individuals, the influence of the adverse effects on adherence to treatment, and the relation of the socioeconomic level, educational level, and cultural aspects to the treatment of the disease.

In the North American population in the years 1992-1994, Hyman and Pavlik [26] reported that 31% of the hypertensive individuals ignored their condition and only 23% had an adequate control of their systemic arterial hypertension through medication. Using the same criteria for the population of the state of Rio

Grande do Sul, the proportion of hypertensive individuals ignoring their condition was 49.2%, while the proportion controlling their blood pressure levels with medicamentous treatment was only 10.4%, a significant difference as compared with the North American data. Other studies conducted in Brazilian cities [21,24] have shown the prevalence of systemic arterial hypertension and proportion of control with the use of antihypertensive medication similar to the results obtained in the state of Rio Grande do Sul. These results show that the efforts to identify and control systemic arterial hypertension should be a public health priority at the national level.

Parallel to the major objectives of this study, women in the sample were observed to have lower income and educational levels than did men. Due to the known relation between the social inequality and the health condition of the population, this additional finding should not be underestimated, but should be considered in future research projects and in the planning of health promotion actions. Therefore, the recognition of the unfavorable socioeconomic level of the women in the state of Rio Grande do Sul should serve as a warning to avoid gender inequality in health care and to promote adequate action.

Despite of the methodological differences between the studies on systemic arterial hypertension carried out in the state of Rio Grande do Sul in 1978 [19] and in the city of Porto Alegre in 1994 [20], the coherence observed between their results favors the adoption of studies in the state level with methodology similar to that used in the study on the prevalence of risk factors for coronary artery disease in the state of Rio Grande do Sul (Prevalência de Fatores de Risco da Doença Arterial Coronariana no Rio Grande do Sul) [17], the

first national study to measure the prevalence of coronary risk factors in an entire Brazilian state. Due to the need for identifying the local risk factors and knowing the natural history of cardiovascular diseases, the intersectorial collaboration and the use of the health care structure of the state and municipal health secretariats represent an effective alternative for the construction of knowledge directed to the health needs of the population. Networks of research support with members in the diverse levels of the structure of our health and educational systems represent one of the viable alternatives for the increase in scientific production.

The cross-sectional design of this study does not allow the definition of causal associations between the characteristics studied and the different groups of hypertensive individuals; some associations analyzed, however, seem very appropriate. The role played by low educational level both in the prevalence of systemic arterial hypertension and in its awareness confirm the existence of a relation between social inequality and health inequality. In addition, actions on the population and individual levels directed to body weight control would have a significant impact on the prevalence of systemic arterial hypertension, its awareness and control. These actions could be directed to different social levels and actors, such as the food commerce and industry [27]. The most effective way to reduce the impact of cardiovascular diseases at the population level is to develop preventive and therapeutic actions for risk factors, ie, to develop actions of health promotion and primary prevention. Therefore, the diagnosis of systemic arterial hypertension and its effective treatment should be prioritized in the struggle against the increasing prevalence and incidence of cardiovascular diseases in our country.

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