Research

FACTORS ASSOCIATED WITH ARTERIAL HYPERTENSION AMONG USERS OF A HEALTH PROMOTION SERVICE

FATORES ASSOCIADOS À HIPERTENSÃO ARTERIAL EM USUÁRIOS DE SERVIÇO DE PROMOÇÃO À SAÚDE

FACTORES ASOCIADOS A LA HIPERTENSIÓN EN USUARIOS DE SERVICIO DE PROMOCIÓN DE LA SALUD

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Submitted: 14/06/2011   Approved: 12/12/2012

ABSTRACT

This is cross sectional study to identify factors associated with systemic arterial hypertension (SAH) among users ≥20 years who enrolled in the health promotion service of Belo Horizonte, MG, Brazil, between February and September 2007. Data collected included demographics, anthropometrics, reported morbidity, and dietary habits. Among the 300 individuals evaluated, 87.3% were women with a mean age of 50.2±14.2 years. A high prevalence of morbidities and unfavorable dietary habits could be observed. The following factors were associated with SAH: among adults – age ≥ 40 years (OR=11.1; 95% CI: 3.6-34.3), excess weight (OR=8.0; 95% CI: 2.0-31.2), diabetes (OR=5.0; 95% CI: 2.0-12.8), and "nibbling" between meals (OR=2.6; 95% CI: 1.3-5.4); and among the elderly, overweight (OR=2.9; 95% CI: 1.0-8.4). The exposure of modifiable factors that possibly contributed to the development of SAH could be identified, particularly among adults. It can be concluded that these factors should be improved in an attempt to contribute to both the prevention and better control of SAH.
Keywords: Hypertension; Obesity; Health Promotion; Food Habits; Public Health.

RESUMO

Trata-se de estudo transversal com o objetivo de identificar fatores associados à hipertensão arterial sistêmica (HAS) entre usuários ≥ 20 anos que ingressaram em um serviço de promoção à saúde de Belo Horizonte-MG entre fevereiro a setembro de 2007. Foram coletados dados demográficos, antropométricos, morbidade referida e hábitos alimentares. Dentre os 300 indivíduos avaliados, 87,3% eram mulheres, com média de idade de 50,2±14,2 anos. Houve elevada prevalência de morbidades e hábitos alimentares desfavoráveis. Foram fatores associados à HAS: entre os adultos – idade ≥40 anos (OR=11,1 IC95%:3,6-34,3), excesso de peso (OR=8,0; IC95%:2,0-31,2), diabetes (OR=5,0; IC95%:2,0-12,8) e hábito de "beliscar" entre as refeições (OR=2,6; IC95%:1,3-5,4); e para os idosos, o sobrepeso (OR=2,9; IC95%:1,0-8,4). Identificaram-se exposições modificáveis que possivelmente contribuíram para o desenvolvimento da HAS, principalmente entre os adultos. Sugere-se que esses fatores sejam trabalhados com o objetivo de contribuir para a prevenção e melhor controle da HAS.
Palavras-chave: Hipertensão; Obesidade; Promoção da Saúde; Hábitos Alimentares; Saúde Pública.

RESUMEN

Se trata de un estudio transversal para identificar los factores asociados con la hipertensión arterial sistémica (HAS) entre usuarios ≥20 años que se inscribieron en un servicio de promoción de la salud de Belo Horizonte-MG, de febrero a septiembre de 2007. Se recogieron los datos demográficos, antropométricos, se informó la morbilidad y las costumbres alimenticias. Entre los 300 individuos evaluados, 87,3% eran mujeres, edad media 50,2±14,2 años. Se observó alta prevalencia de morbilidad y costumbres alimenticias desfavorables. Los factores asociados con la HAS: entre los adultos fueron – edad ≥40 años (OR=11,1 IC95%:3,6-34,3), exceso de peso (OR=8,0; IC95%:2,0-31,2), diabetes (OR=5.0; IC95%:2.0-12.8) y costumbre de pellizcar entre las comidas (OR=2,6; IC95%:1,3-5,4) y, entre los adultos mayores, sobrepeso (OR=2,9;IC95%:1,0-8,4). Se identificaron factores de riesgo modificables que, posiblemente, han contribuido al desarrollo de la HAS, en particular entre los adultos. Se sugiere que estos factores sean trabajados para contribuir a la prevención y mejor control de la HAS.
Palabras clave: Hipertensión; Obesidad; Promoción de la Salud; Costumbres Alimenticiais; Salud Pública.

INTRODUCTION

Systemic arterial hypertension (SAH) shows a direct and positive relationship with cardiovascular risks. It is clear that, despite the advances in the prevention and control of this illness, it is still a serious issue in public health today.[1] In Brazil, it is estimated that the prevalence of SAH varies from 22.7% to 43.9%.[2,3] These high rates contribute to 31.8% of the Brazilian deaths caused by cardiovascular diseases.[2,4]

SAH is associated with non-modifiable exposure factors, such as age, heredity, gender, and ethnicity/race, as well as modifiable factors, such as clinical, behavioral, and nutritional factors.[4,5] Clearly, public health strategies are necessary to deal with these modifiable factors, which will reduce the risk of exposure, bringing with it individual and collective benefits for the prevention of SAH and a reduction in the burden of chronic illnesses.[1,2]

Diabetes and dyslipidemias are clinical factors that are also associated with SAH. It has been reported that the prevalence of SAH in diabetic patients can be twice as higher, and the association between dyslipidemia and SAH represents more than a 50% risk, which can be attributed to coronary artery disease.[2]

As regards modifiable factors, it has been reported that the excess of body mass may well be responsible for 20% to 230% of all SAH cases[4], especially when the fat deposit is concentrated in the abdominal region.[2,4,6] Moreover, it can be observed that the good quality of one's diet is intrinsically linked to the control of blood pressure levels.[2,7]

In this light, the present study proposes two main therapeutic approaches: modifications in one's lifestyle (MLS: weight loss, physical exercise, and healthy diet) and treatment with medicine.[8,9] It should be emphasized that the MLS are factors that must be properly dealt with and controlled, given that progressive doses of medicines will not achieve the recommended blood pressure levels.[2]

Considering the impact of SAH on health, the present study aimed to identify the factors associated with SAH among the users of the Academia da Cidade Program in the Sanitário Leste (East Sanitation) District of the city of Belo Horizonte, MG, Brazil, in an attempt to provide intervention strategies for the prevention and control of modifiable factors related to this illness.

MATERIALS AND METHODS

This study was carried out on a sample of users from the Academia da Cidade Program in the Sanitário Leste (East Sanitation) District of the city of Belo Horizonte, MG, Brazil, which belongs to the *Healthier Belo Horizonte* (*BH + Saudável*) project.

Healthier Belo Horizonte

The *Healthier Belo Horizonte* project – the Promotion of Healthy Lifestyles – is managed by the local Health Department of the city of Belo Horizonte. Among the project's actions geared toward promoting health, as set forth by the Global Strategy from the World Health Organization (WHO),[10] the most important are the Academia da Cidade Programs, health promotion services that promote physical exercise for socially vulnerable populations, and the nutritional advice regarding the control of non-transmissible chronic diseases (NTCD).

The Academia da Cidade Program studied in this work is located in a highly vulnerable social area of Belo Horizonte. The registered users practice physical exercise three times a week, in addition to participating in collective and individual nutritional health services.

Study design

This is an epidemiological, cross-sectional, and analytical study carried out on all the users who were equal to or older than 20 years of age – a total of 364 individuals – who had joined the Academia da Cidade Program, located on the east side of the city of Belo Horizonte, MG, Brazil, from February 2007 to February 2008.

Data collection and diagnostic criteria

The data were obtained face to face, with the aid of a semi-structured and validated questionnaire, whose application lasted an average of 40 minutes. The questionnaire was applied by duly trained interviewers at the moment when the individual joined the Academia da Cidade Program, which included data on sociodemographics (age and gender), health (use of medications and referent morbidity), and dietary habits. Anthropometric measurements (weight, height, and waist and hip circumferences).[11]

To evaluate the frequency with which food and alcoholic drinks were consumed, the Food Frequency Questionnaire (FFQ) was used, which consisted of a list of 16 foods and their consumption within the past six months. This FFQ was constructed based on an FFQ that had been calibrated for people from the countryside of the state of Minas Gerais and was revised based on the food obtained through the R24 analysis performed at a health service itself, in a pilot study.[11]

Practicing of physical activity was classified considering the sedentary individual when the physical activity was less than 1.3.[12]

The anthropometric measurements of weight, height, waist circumference (WC) and hip circumference (HC) were verified according to that recommended by the WHO.[12] Having taken the measurements of weight and height, the body mass index (BMI)

was calculated (BMI=weight/height^2), whose classification was differentiated for adults[13] (eutrophia: 18.5 – 24.9kg/m^2, overwieght: 25.0 – 29.9 kg/m^2; and obesity: ≥ 30.0 kg/m^2) and for the elderly[14] (eutrophia: 22.0 – 27.0 kg/m^2 and overweight: ≥ 27.0 kg/m^2).

Using the WC and HC measurements, the waist-hips ratio was calculated (WHR = WC/HC). Recommendations from the WHO were implemented to evaluate the WC (complications associated with obesity: no risk = WC < 80 cm for women and WC < 94 cm for men; high risk = WC ≥ 80 cm for women and WC ≥ 94 cm for; extremely high risk = WC ≥ 88 cm for women and WC ≥ 102 cm for men) and the WHR (at risk: ≥ 0.85 for women and ≥ 1.0 for men)[3]. To take these measurements, the interviewers were duly trained, with three readings performed to obtain an arithmetic mean, which was then recorded.

The definition of the individual diagnosed with SAH was obtained by means of the patient's report of morbidity and use of specific medications. By contrast, the diagnosis of heart disease was obtained by means of an affirmative answer to at least one of the questions of anamnesis as regards a patient reporting episodes of angina, heart attacks, irregular heartbeats, and heart disease. The definitions of diabetes, hypercholesterolemia and hypertriglyceridemia were obtained by reports of morbidity and/or the use of specific medications for treatment. Dyslipidemia was defined by the presence of hypercholesterolemia and hypertriglyceridemia.

Data analysis

The statistical analysis was performed using *The SAS System for Windows* (*Statistical Analysis System*, version 8.02). The individuals were classified as adults (≥20 years and <60 years) and elderly (≥60 years).

A descriptive analysis of the data and Pearson's chi-squared test were performed to verify the possible associations between the prevalence of SAH and the covariables. The strength of association among the variables was determined by the odds ratio (OR) and its respective 95% confidence interval (CI). The covariables that pre-

sented a statistical significance of lower than 20.0% were considered to be candidates for the final model of logistic regression (p<0.20).

As regards the selection of the final model, the *Stepwise* strategy was adopted, with the inclusion of all of the variables selected during the bivariate analysis in a decreasing order of statistical significance. The variables that presented p>0.05 were removed one by one from the model and considered definitively excluded when the decline in the explanation of the outcome was not statistically significant. Terms of interaction were also tested, considering that described in prior literature and their biological plausibility. Statistical significance was set at 5.0% (p≤0.05).

The present study was approved by the Committee on Ethics in Research from Universidade Federal de Minas Gerais (103/07) and from the Municipal Government of Belo Horizonte (087/2007). All participants, after having been informed about the research, signed a Free Written Consent Form.

RESULTS

All of the 300 participants evaluated within this period gave their consent to participate in this research. Of these, 87.3% were women, with a mean age of 50.2±14.2 years. It could be observed that 74.4% were sedentary when they joined the gym. The overall frequency of SAH was 35.0% (n=105) and, when divided into adults (n=220) and elderly (n=80), the frequencies of hypertension were 25.5% and 61.3%, respectively.

A high frequency of other illnesses could also be observed, particularly: dyslipidemias (35.7%), obesity in adults (33.7%), overweight in the elderly (18.0%), heart diseases (16.3%), and diabetes (16.0%) (Table 1).

As regards dietary habits, 56.7% reported the habit of eating while watching TV; 49.0% "nibbled" between meals; 48.3% had ≤3 meals/day. This study also identified an unfavorable frequency in the daily consumption of green leafy vegetables (53.3%), fruits (51.0%), vegetables (41.3%,) fried meats (31.3%), sweets (15.0%), and animal fat (9.3%) (Table 1).

Table 1 - Description of user health and eating profiles

Variables*	Total (n=300)	With Hypertension (n=105)	Without Hypertension (n=195)	P value adults[†]	P value elderly[‡]
Adults (n=220)	73,3	25,5	74,5	–	–
Elderly (n=80)	26,7	61,3	38,7	–	–
Health Conditions					
Systemic arterial hypertension	35,0	–	–	–	–
Overweight adults	26,0	19,0	30,0	0,024	–
Obesity in adults	33,7	31,0	34,9	0,004	–
Excess weight in adults	59,7	50,5	64,6	0,007	–
Overweight elderly	18,0	36,2	8,2	-	0,048
Hypercholesterolemia	32,7	46,7	25,1	0,002	0,899

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Table 1 - Description of user health and eating profiles

Variables*	Total (n=300)	With Hypertension (n=105)	Without Hypertension (n=195)	P value adults[†]	P value elderly[‡]
Health Conditions					
Hypertriglyceridemia	17,3	28,6	11,3	0,004	0,151
Dyslipidemia	36,0	49,5	28,2	0,003	0,982
Diabetes	16,0	27,6	9,7	< 0,001	0,742
Heart disease	16,3	25,7	11,3	< 0,001	0,989
Dietary habits					
Eating while watching TV	56,7	50,5	60,0	0,360	0,714
"Nibbling" between meals	49,0	53,3	46,7	0,076	0,492
Have ≤3 meals a day	48,3	56,2	44,1	0,159	0,507
Animal fat – daily consumption	9,3	9,5	8,7	0,961	0,939
Preparation of fried meats	31,3	21,9	35,9	0,084	0,269
Fried foods – daily consumption	9,7	3,8	12,8	0,114	0,165
Fruits – non-daily consumption	51,0	41,9	55,9	0,061	0,995
Green leafy vegetables – non-daily consumption	53,3	51,4	54,3	0,486	0,345
Vegetables – non-daily consumption	41,3	46,7	38,5	0,550	0,684
Sweets – daily consumption	15,0	11,4	16,9	0,223	0,931

Note: *Univariate logistic regression analysis for arterial hypertension;
† Adults (n=220) – With Hypertension (n=56); Without Hypertension (n=164);
‡ Elderly (n=80) – With Hypertension (n=49); Without hypertension (n=31).
Source: Drafted by authors based on research data.

The modifiable factors associated with SAH in the univariate analysis proved to be different between adults and the elderly. Among adults, a greater chance of SAH could be observed among those with obesity, high/extremely high risk for metabolic diseases associated with obesity (WC), risk for the development of diseases (WHR), cardiovascular diseases, hypercholesterolemia and hypertriglyceridemia. Among the elderly, a positive association could be observed between begin overweight and contracting SAH, while the family history of strokes presented a protector effect (Table 2).

It is important to note that, after having performed the multivariate analysis, the variables that were still associated with SAH in adults included: age ≥40 years (OR=11.1 95% CI: 3.6-34.3), excess weight (OR=8.0; 95% CI: 2.0-31.2), diabetes (OR=5.0; 95% CI: 2.0-12.8), and the habit of "nibbling" between meals (OR=2.6; 95% CI: 1.3-5.4); whereas for the elderly, only being overweight could be observed (OR=2.9; 95% CI: 1.0-8.4) (Table 3).

Other factors, such as gender, sedentariness, smoking, intake of alcoholic beverages, proved not to be associated with SAH.

Table 2 - Factors associated with arterial hypertension in a univariate regression analysis

Variables*	With Hypertension (%)	Without Hypertension (%)	P Value	OR[†] (95% IC [†])
Adultos (n=220)	25,5	74,5	-	–
Age (anos)				
< 40 years	7,1	43,9	-	1,00
≥ 40 years	92,9	56,1	< 0,001	10,2 (3,5-29,5)
Body Mass Index				
Eutrophic	5,4	23,2	-	1,00
Overweight	35,7	35,4	0,024	4,4 (1,2-15,7)
Obese	58,9	41,5	0,004	6,2 (1,8-21,4)
Excess weight	94,6	76,8	0,007	5,3 (1,6-18,0)

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Table 2 - Factors associated with arterial hypertension in a univariate regression analysis

Variables*	With Hypertension (%)	Without Hypertension (%)	P Value	OR† (95% IC ‡)
Waist circumference				
No risk	12,5	33,5	-	1,00
High risk	28,6	27,4	0,038	2,8 (1,1-7,4)
Extremely high risk	58,9	39,0	0,002	4,0 (1,7-9,9)
High and extremely high risk	87,5	66,5	0,004	3,5 (1, 5-8,3)
Waist-hip ratio				
No risk	48,2	76,8	-	1,00
At risk for diseases	51,8	23,2	< 0,001	3,6 (1,9-6,7)
Morbidities				
Diabetes	32,1	7,9	< 0,001	5,5 (2,5-12,2)
Hypercholesterolemia	41,1	20,1	0,002	2,8 (1,4-5,3)
Hypertriglyceridemia	26,8	10,4	0,004	3,2 (1,5-6,9)
Dyslipidemia	44,6	23,2	0,003	2,7 (1,4-5,1)
Heart disease	28,6	9,1	< 0,001	4,0 (1,8-8,7)
Elderly (n=80)	61,3	38,7	-	-
Body Mass Index				
Eutrophic	18,4	35,5	-	1,00
Overweight	77,6	51,6	0,048	2,9 (1,0 -8,4)
Family history of strokes	28,6	51,6	0,041	0,4 (0,2-1,00)

Note: *Univariate logistic reression analysis for arterial hypertension;
† OR – odds ratio for arterial hypertension;
‡95% CI – 95%Confidence Interval for OR.
Source: Drafted by authors based on research data.

Table 3 - Multivariate logistic regression analysis for SAH

Selected variables		Categories	P value	OR*	95% IC†
Adults‡	Age ≥40 years	<40 years	–	1,00	–
		≥40 years	<0,001	11,09	3,59 – 34,32
Adults‡	Body Mass Index (BMI)	Eutrophic	–	1,00	–
		Excess weight	0,003	8,00	2,05 – 31,21
Adults‡	Diabetes	No	–	1,00	–
		Yes	<0,001	5,10	2,03 – 12,81
Adults‡	"Nibble between meals"	No	–	1,00	–
		Yes	0,009	2,63	1,27 – 5,43
Elderly§	Body Mass Index (BMI)	Eutrophic	–	1,00	–
		Overweight	0,048	2,90	1,01 – 8,35

Note: * * OR – odds ratio for arterial hypertension.
† 95% CI – 95% Confidence Interval for OR.
‡ Adults (n=220) – Without hypertension (n=164); With hypertension (n=56). Stepwise criteria to select variables.
§ Elderly (n=80) – Without hypertension (n=31); With hypertension (n=49). Stepwise criteria to select variables.
Source: Drafted by authors based on research data.

DISCUSSION

This study's results demonstrate that SAH represents a serious health problem among users of the Academia da Cidade Program analyzed in this work, considering that its prevalence was quite high. In addition, what could also be clearly noted was the positive association with modifiable factors, such as excess weight and dietary habits, both of which can be reverted through health promotion services.

Among the non-modifiable factors, the association between SAH and age could be observed, which proved similar to prior population studies.[2,5,15] For example, in the city of Ouro Preto, MG, Brazil, individuals of 40 years of age or less presented a lesser chance of developing SAH when compared to those of 40 to 59 years of age (women OR=6.5; 95% CI: 3.6-11.7, men OR=2.5; 95% CI: 1.4-4.6) and ≥60 years of age (women OR=31.6; 95% CI: 10.0-100.3, men OR=11.1; 95% CI: 3.9-31.4). It is well-known that aging commonly produces a hardening of the vascular wall which induces an increase in peripheral artery resistance and a consequent increase in blood pressure.[5]

However, for the variable of gender, no statistically significant difference could be found, which is similar to that reported by Kearney et al.[16] (men: 26.6%; 95% CI: 26.0-27.2 and women: 261%; 95% CI: 25.5-26.6). This study was not stratified by gender, given the large prevalence of females (87.3%). This proportion can be explained by the greater concern about one's health found in women, as well as by the morning working hours of the gym itself, which demands a specific time availability on the part of its users.

As regards the modifiable factors, a high prevalence could be observed concerning excess weight and obesity, results which proved to be higher than those found in Belo Horizonte, according to findings from Vigitel (2011)[3], in which 45.3% of the individuals ³18 years of age presented excess weight, while 14.2% presented obesity. Although the service's aim is to promote health, many users seek out these services due to the condition of their illness and/or because they were referred by Family Health Teams (FHT), which can justify such a prevalence.

Excess weight deserves attention, as it remained significant in the multivariate analysis, as also found in other studies.[17-19] By contrast, as regards the abdominal adiposity, the WC variable and WHR were not maintained in the model. However, it should be emphasized that the abdominal fat can be associated with a greater incidence of SAH and the resistance to insulin.[2,18,20-22]

It should also be noted that variables, such as diabetes, were positively associated with SAH among adults. Studies[2,4] have also shown that diabetic patients presented at least twice the chance of presenting SAH than did the general population, considering that, in type-1 diabetes, hypertension is associated with diabetic nephropathy, while in type-2 diabetes, it is associated with insulin resistance syndrome and high cardiovascular risk.

No correlation could be drawn between smoking, the intake of alcoholic beverages, and sedentariness, and the onset of SAH, which is in accordance with findings from Pimenta et al.[17] and Jardim et al.[18] However, the biological plausibility of these factors should be highlighted, as it is well-known that physical activity, regardless of the reduction in body mass, brings about a hypertensive effect, which appears to be related to the reduction in activities that bring about greater vasodilation and arterial compliance.[7,23] Much like the association of alcoholic beverages and smoking with SAH, this illness is also cited within the Brazilian Guidelines for Arterial Hypertension,[4] illustrating that the magnitude of these effects are associated with the quantity and frequency of the intake of alcohol and the number of cigarettes, as well as the depth of inhalation, respectively. Therefore, there is a need to improve the prevention and control of these factors among the gym's users.

Dietary habits that were unfavorable to one's health could be observed among the interviewees. The most common habit was that of "nibbling between meals", which proved to be associated with SAH, most likely due to the fact that the food chosen to be "nibbled" was, in the majority of cases, rich in sugar, saturated fats, and sodium, representing an eating pattern that was unfavorable to the control of one's blood pressure, according to pre-established recommendations.[3,8,24,25]

However, such an association does not reflect causality, since the exposure factor and the outcome were measured at the same time, one limitation of the cross-sectional design used in this study. The obtained data are of utmost importance in identifying and measuring possible factors for the prevention and/or control of SAH.

CONCLUSION

The results allowed for the identification of the exposure of modifiable factors, such as inappropriate dietary habits and excess weight, which contribute to the onset of SAH, mainly in adults, although this has not been defined as a causal effect, due to the cross-sectional design of this study. Therefore, it can be concluded that such factors should be improved through physical exercise and nutritional advice, in turn contributing to the prevention and improved control of SAH. The Academia da Cidade Program can be used, given the importance of this service, as a point of reference for the Health Assistance Network to build the concept of the integral care of individuals with NTCD.

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