Blood Pressure Levels and their Association with Cardiovascular Risk Factors among Employees of the University of Brasília, a Brazilian Public University

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Objective

To verify and classify, according to the JNC 7, the blood pressure levels (BPL) of the employees of University of Brasilia, a public university in Brazil, who are older than 40 years of age, and to estimate the prevalence of cardiovascular risk factors in this population.

Methods

A cross-sectional study was conducted at the University of Brasilia, with employees over 40 years of age. They answered a questionnaire and had their blood pressure, weight and height measured. The BPLs were classified according to the JNC 7 classification and the demographic data of the subjects in each category were analyzed. The percentage of risk factors was calculated. The statistical analysis was carried out using the ANOVA test and the chi-square test, where applicable.

Results

Seven hundred and four subjects participated in the study, 438 male and 266 female. The median age was 47. According to the JNC 7, 139 (19.8%) subjects were classified as normotensive; 298 (42.3%) as prehypertensive and 267 (37.9%) as hypertensive. The risk factors assessed were overweight/obesity (56.8%), smoking habit (19.5%), alcohol consumption (53.6%), sedentary lifestyle (48.4%) and hypertension (37.9%).

Conclusion

The high frequency of elevated blood pressure levels and cardiovascular risk factors among the employees indicates the need for preventive and therapeutic measures for cardiovascular disease targeted at the university's employees.

Key words

blood pressure, cardiovascular risk factor, hypertension

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Hypertension has been recognized as the major risk factor for early morbidity and mortality caused by cardiovascular diseases. Epidemiologic studies indicate that elevated blood pressure levels (BPLs) increase the risk of cerebrovascular disease, coronary artery diseases, congestive heart failure and chronic renal failure[1,2].

One of the challenges in the prevention and treatment of hypertension is to increase its detection, which starts with the adequate measuring of the blood pressure. Screening for elevated blood pressure levels is a procedure that has to be carried out by a health practitioner as a preventive measure, as part of the routine medical examination. This simple procedure can detect asymptomatic individuals with elevated blood pressure, thus allowing early treatment with medication and/or based on lifestyle changes[3].

Campaigns to prevent and fight hypertension provide another good opportunity to screen asymptomatic individuals with elevated blood pressure levels[4].

In Brazil, there are only regional studies on the epidemiology of hypertension and cardiovascular risk factors, which makes it difficult to establish the prevalence and the size of the problem in Brazil, restricting it to estimates.

In 2002, the University of Brasília (UnB) carried out the campaign "UnB – 40 years with health" on the occasion of the university's 40th anniversary. Among other objectives, the campaign aimed at improving the quality of life in the campus. It was targeted at employees over 40 years of age and was designed to identify cardiovascular risk factors present in such population.

The objective of this paper was to identify and classify blood pressure levels of UnB's employees over 40 years of age, and to estimate the prevalence of cardiovascular risk factors present in such population.

Methods

During the second semester of 2002, on the occasion of the the 40th anniversary of the University of Brasilia, the Deanship of Community Affairs (DAC) presented a project, approved by the higher echelons of the university, to identify the health status of the employees over 40 years of age. All of UnB's sectors and units were consulted through an internal memorandum as to their interest in and agreement to participating in the campaign. No one declined.

The participants were also informed that the data obtained in the survey would be analyzed and processed to allow the workplace to be adapted to the employees, and to promote educational activities to improve their quality of life.

Part of these data have been used to carry out this research, by means of a cross-sectional study. The Ethics Committee for Research Involving Human Subjects of the Medical College analyzed and approved the conduction of this study, provided the DAC authorized it too. This authorization was obtained by means of a document signed by the dean in charge, who was also the coordinator of the overall project.

The collection of data was carried out by undergraduate students of health-related courses, who were trained to act as monitors during the interview and to measure the blood pressure, weight and height of the subjects following standardized procedures. The academic units were visited, and those employees over 40 years of age were assessed.

The tool used in the interview was a questionnaire that was filled out by the monitors, with questions on health habits such as physical activity habits, smoking and alcohol consumption. In addition to the questionnaire, the subject's blood pressure, weight and height were measured at the end of each interview. To measure the blood pressure, the monitors used stethoscopes and aneroid sphygmomanometers, all duly calibrated. The blood pressure was measured in one of the arms. The blood pressure (BP) was classified according to the JNC 7 classification[1] that includes four levels, in mmHg: normal (systolic BP<120 and diastolic BP <80); prehypertension (systolic BP between 120-139 or diastolic BP between 80-89); stage 1 hypertension (systolic BP between 140-159 or diastolic BP between 90-99) and stage 2 hypertension (systolic BP≥160 or diastolic BP≥100)[1].

The body mass index (BMI) was calculated using the following formula: BMI = [weight (kg)]/[height (m)]^2. Regular physical activity was defined as the practice of physical exercise at least four days a week, for at least thirty minutes per day. Those subjects who denied the practice of any kind of physical exercise were considered sedentary. Those subjects who declared to be smokers at the moment of the interview were considered smokers, regardless of the number of cigarettes smoked. Those subjects who admitted to consuming alcohol were considered consumers of alcoholic beverages, regardless of the type and quantity of beverage consumed, or frequency of consumption.

The statistical analysis was carried out by means of analysis of variance (ANOVA) tests to analyze medians and chi-square tests to analyze ratios where applicable.

Results

General data

We assessed 704 employees of the university, of which 438 (62.2%) male and 266 (37.8%) female, with a mean age of 48.5 ± 6.1 and a median of 47 years, ranging from 40 to 72 years of age. Of these, 91 (12.9%) were faculty members and 613 (87.1%) were technical and administrative staff.

Classification of blood pressure

Table I presents the distribution of the subjects according to the classification of their blood pressure levels. Among the subjects, 139 (87 female) presented blood pressure levels within the normal range, amounting to 19.8% of the total.

Blood pressure levels within the prehypertension range were found in 298 (42.3%) of the subjects. In the stage 1 hypertension category, 170 (24.1%) subjects were included. The smaller portion of the sample studied, 97 subjects (13.8%), had blood pressure levels classified as stage 2 hypertension. The total number of hypertensive subjects was 267, that is 37.9% of the participants.

The male gender was associated with a higher prevalence in the prehypertension, stage 1 hypertension and stage 2 hypertension ranges as compared to the normal range (table I).

Variables studied

Table II presents a summary of the data related to the variables studied, according to the gender and to the blood pressure classification.

Figure 1 shows the prevalence of cardiovascular risk factors identified in the study. A BMI > 25, corresponding to overweight and obese subjects, was found in 400 (56.8%) subjects, and stood out as the most prevalent risk factor. There was a total of 137 (19.5%) smokers. The practice of physical exercise was mentioned by 364 subjects, in that 143 subjects were engaged in regular physical activities lasting at least thirty minutes, at least four days a week, amounting to 20.31% of the total number of participants. Sedentary lifestyle was present in 48.3% of the sample (340 subjects). Of the total number of subjects, 377 (53.6%) declared they consumed alcoholic beverages, of which 6% consume such beverages on a daily basis, 50% on a weekly basis, 10.8% on a monthly basis and 33.2% rarely consume them.

The association between the blood pressure classification and cardiovascular risk factors is represented on table III, by using odds ratios (OR) adjusted for gender. A BMI > 25 and alcohol consumption were strongly associated to the highest blood pressure levels, in both genders. There was no correlation between increased blood pressure levels and the prevalence of smoking habit and sedentary lifestyle.

Discussion

It is estimated that there are approximately one billion hypertensive individuals worldwide, and that in the United States hypertension affects fifty million people[1]. In Brazil, there are no consistent data on the prevalence of hypertension which is estimated between 15% and 47.8% for men and 15% and 41.1% for women[5-7] was chosen. This study revealed blood pressure values associated with hypertension in 37.9% of the individuals assessed with a prevalence of 45.9% among male subjects, and 24.8% among female subjects.

Table I – Distribution of subjects according to the blood pressure classification proposed by JNC 7

	Normal n (%)	Prehypertension n(%)	Stage 1 Hypertension n (%)	Stage 2 Hypertension n (%)
Total	139 (19.8)	298 (42.3)	170 (24.1)	97 (13.8)
Male	52 (37.4)	185 (62.1)	126 (74.1)	75 (77.3)
Female	87 (62.6)	113 (37.9)	44 (25.9)	22 (22.7)
Mean age*	47.5±5.2	48.1±6.0	**49.2±6.6#**	**50.7±6.3#**

**± Standard deviation*
#p < 0,05 as compared to normotensive subjects

Table II – Prevalence of variables studied according to the blood pressure classification, adjusted for gender

	Normal n (%)	Prehypertension n (%)	Stage 1 Hypertension n (%)	Stage 2 Hypertension n (%)
Male	52 (100)	185 (100)	126 (100)	75 (100)
BMI >25	24 (46.2)	110 (59.5)	83 (65.9)	55 (73.3)
Smoking habit	18 (34.6)	35 (18.9)	27 (21.4)	20 (26.6)
Regular physical activity	14 (26.9)	32 (17.3)	27 (21.4)	14 (18.7)
Alcohol consumption	18 (34.6)	135 (73.0)	83 (65.9)	50 (66.6)
Female	87 (100)	113 (100)	44 (100)	22 (100)
BMI >25	30 (34.5)	58 (51.3)	27 (61.4)	13 (59.1)
Smoking habit	11 (12.6)	18 (15.9)	05 (11.4)	03 (13.6)
Regular physical activity	21 (24.1)	22 (19.5)	09 (20.5)	04 (18.2)
Alcohol consumption	11 (12.6)	53 (46.9)	18 (40.9)	09 (40.9)

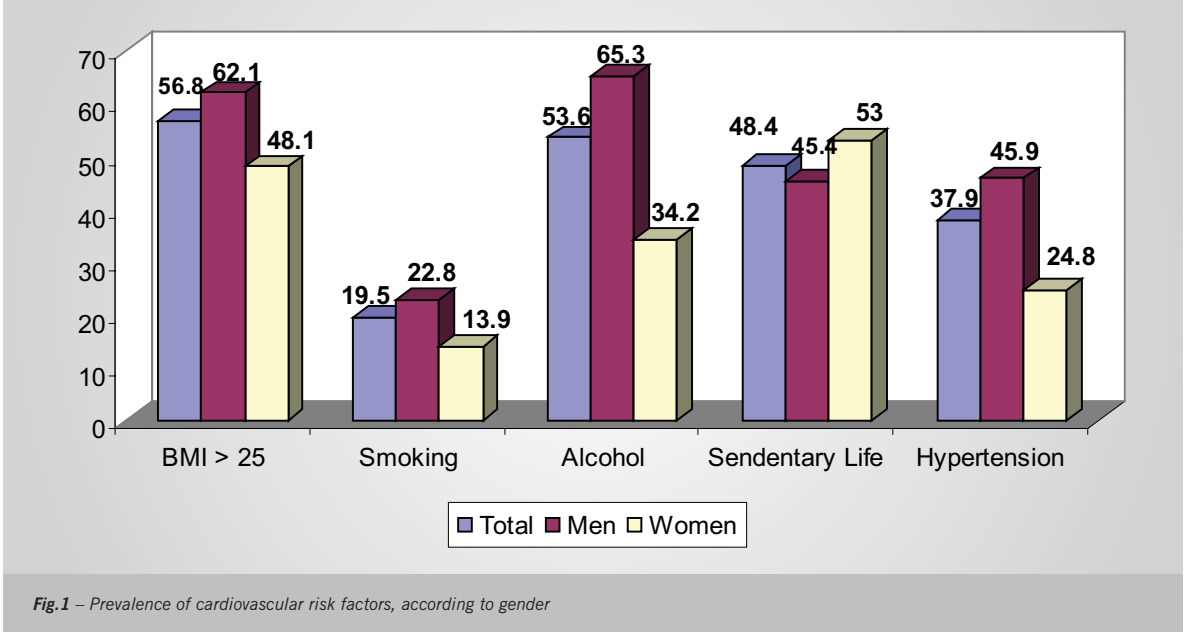

Fig.1 *– Prevalence of cardiovascular risk factors, according to gender*

Table III – Association between the blood pressure classification and the presence of cardiovascular risk fators

	Prehypertension OR* [IC 95%]	Stage 1 Hypertension OR* [IC 95%]	Stage 2 Hypertension OR* [IC 95%]
Male			
BMI >25	1.71 [0.88-3.33]	2.25 [1.11-4.59]	3.21 [1.42-7.28]
Smoking habit	0.44 [0.21-0.92]	0.52 [0.24-1.12]	0.69 [0.30-1.59]
Sedentary lifestyle	1.06 [0.55-2.07]	1.13 [0.56-2.28]	1.48 [0.68-3.21]
Alcohol consumption	5.18 [2.52-10.39]	3.65 [1.76-7.63]	3.78 [1.68-8.57]
Female			
BMI >25	2.00 [1.08-3.72]	3.02 [1.34-6.87]	2.74 [0.96-7.97]
Smoking habit	1.31 [0.55-3.17]	0.89 [0.25-3.03]	1.09 [0.22-4.86]
Sedentary lifestyle	0.90 [0.49-1.63]	1.02 [0.46-2.25]	1.02 [0.36-2.89]
Alcohol consumption	6.01 [2.79-13.71]	4.78 [1.85-12.58]	4.78 [1.47-15.75]

**OR: odds ratio*

The lowest frequency range for hypertension was above the range reported in the Brazilian literature, which is certainly due firstly to the higher mean age of the population studied relative to other population studies, and secondly because these data result from a screening campaign, able to detect only the instantaneous blood pressure value.

The blood pressure values can be classified according to several guidelines published by Brazilian and international organizations engaged in the study of hypertension. At present, the two classifications most widely used are the ones provided by the JNC 7[1] and by the WHO/ISH (World Health Organization/International Society of Hypertension)[8]. The Brazilian guidelines on hypertension[9] follow basically the ISH's recommendations.

UnB's Nephrology Group, registered at CNPq (National Council for Scientific and Technological Development), that has provided advice to this subproject, has been following the JNC guidelines since its 4th version; for this reason, the same reference was maintained.

The latest edition of JNC 7[1] features significant changes relative to the previous version, of which the classification of the blood pressure in people over 18 years of age stands out. The blood pressure levels were divided into four categories: normal, prehypertension, stage 1 hypertension and stage 2 hypertension[1].

The new "prehypertension" classification may be understood as a warning to physicians and patients as to the meaning of blood pressure levels included within this range[10]. Lifestyle changes are recommended for these levels of blood pressure upwards from the JNC 7[1], as it was verified that cardiovascular morbidity and mortality associated with blood pressure levels start at these levels and even at lower levels[1]. In our sample, a large number of subjects (42.3%) presented blood pressure levels within the prehypertension range, which attests to the

importance of providing guidance on healthy life habits for this population.

The prevalence of hypertension increases with age, and is estimated at 50% of the individuals over sixty years of age[3]; the lifetime risk of becoming hypertensive also increases with age, and reaches 90% in individuals who are normotensive at 55 years of age[1]. In our study, conducted with subjects over forty years of age, there was a progressive increase in the mean age at each blood pressure classification level; in the hypertension ranges, such difference was statistically significant as compared to subjects within the normal range.

Lifestyle plays a critical role in the determination of the blood pressure level for individuals and in the prevalence of hypertension in populations. Several lifestyle-related factors seem to influence blood pressure levels in a direct manner, for individuals and populations alike. The most important of them are excess body fat, alcohol consumption, physical activity and a variety of diet elements[11].

Observing figure 1, we see that the prevalence of smoking nears the values found by other authors in populations of universities. A study by Ribeiro et al[12] detected a total prevalence of smokers of 15.5% in a university in São Paulo, whereas Sabry et al found a 26.2 % rate in Ceará[13]. Although smoking is an established risk factor for hypertension, in our study the difference between the "normal" group and the "hypertensive" group was not statistically significant for this parameter.

The high prevalence of overweight in this population (56.8%) was congruous with the worrisome indices presented in the literature. Matos et al[14] observed a prevalence of 58% of individuals with BMI above 25, and Jenei et al[15] found a 53.73% rate. Overweight was significantly higher in the "hypertensive" group, an association found by several authors[16,17].

According to the JNC 7[1] guidelines, it is advised to do at least thirty minutes of physical exercise on most days of the week[1]. In our sample, 51.7% of the subjects reported doing physical exercise, but only 20.31% of the total practice physical activities on a regular basis. Other authors also found high prevalence rates of sedentary lifestyle in our midst, ranging from 47% to 63% of the population[5,14].

The consumption of alcoholic beverages was reported by 53.6% of the sample of our study. Sabry et al[13] found a prevalence of 57.7%. There was no quantitative assessment of alcohol ingestion, and for this reason we were unable to identify subjects who consumed alcohol in excess. Alcohol restriction may decrease blood pressure[18,19] and is a lifestyle change recommended by the JNC 7[1]. In this paper, there were higher blood pressure levels among alcohol drinkers than among non-drinkers. This association was also identified by Okubo et al[20].

Brazilian studies on the prevalence of hypertension and/or cardiovascular risk factors are scarce. Additionally, another factor that makes it difficult to make a comparative analysis of the literature is the wide variety of methodologies employed in these studies. Having in mind the specific group of this study, the limitation is that it is not possible to generalize its data and conclusions to the population in general.

Lifestyle changes potentially prevent hypertension, are effective in decreasing blood pressure and may reduce other cardiovascular risk factors at a small cost and with minimum risks[11].

In this study, the group analyzed presented a high prevalence of high blood pressure, in addition to other cardiovascular risks, which suggests the need for adopting educational preventive measures and therapeutic measures relative to cardiovascular diseases in this University. It is essential to conduct further epidemiological studies on hypertension in Brazil to develop knowledge on blood pressure levels and risk factors for different population strata, to enable the planning of more effective interventions.

References

1. Chobanian AV, Bakris GL, Black HR et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Hypertension 2003; 42:1206-52.
2. Wong ND, Thakral G, Franklin SS et al. Preventing heart disease by controlling hypertension: Impact of hypertensive subtype, stage, age and sex. Am Heart J 2003;145: 888-95.
3. Whelton PK, He J, Appel LJ et al. Primary prevention of hypertension: Clinical and public health advisory from the National High Blood Pressure Education Program. JAMA 2002; 288(15):1882-88.
4. U.S. Preventive Services Task Force. Screening for high blood pressure: recommendations and rationale. Am Fam Physician 2003; 68(10):2019-22.
5. Duncan BB, Schmidt MI, Polanczyk CA et al. Fatores de risco para doenças não-transmissíveis em área metropolitana na região sul do Brasil. Prevalência e simultaneidade. Rev Saúde Pública 1993; 27(1):143-8.
6. Freitas OC, Resende de Carvalho F, Marques Neves J et al. Prevalência da hipertensão arterial sistêmica na população urbana de Catanduva, SP. Arq Bras Cardiol 2001; 77(1):9-15.
7. Martins IS, Mauricci MF, Velásquez-Melendez G et al. Doenças cardiovasculares ateroscleróticas, dislipidemias, hipertensão, obesidade e diabetes melito em população da área metropolitana da região Sudeste do Brasil. III- Hipertensão. Rev Saúde Pública 1997; 31(5):466-71.
8. World Health Organization, International Society of Hypertension Writing Group. 2003 World Health Organization (WHO)/ International Society of Hypertension (ISH) statement on management of hypertension. J Hypertens 2003; 21:1983-92.
9. Sociedade Brasileira de Hipertensão- SBH, Sociedade Brasileira de Cardiologia- SBC, Sociedade Brasileira de Nefrologia- SBN. IV Diretrizes Brasileiras de Hipertensão Arterial. Arq Bras Cardiol 2004; 82(supl IV):15-22.

10. Jones DW, Hall JE. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure and evidence from new hypertension trials. Hypertension 2004; 43:1-3.

11. Beilin LJ, Puddey IB, Burke V. Lifestyle and hypertension. Am J Hypertens 1999; 12:934-45.

12. Ribeiro SA, Jardim JK, Laranjeira RR et al. Prevalência de tabagismo na Universidade Federal de São Paulo, 1996- dados preliminares de um programa institucional. Rev Ass Méd Brasil 1999; 45(1):39-44.

13. Sabry MOD, Sampaio HA, Silva MGC. Tabagismo e etilismo em funcionários da Universidade Estadual do Ceará. J Pneumol 1999; 25(6):313-20.

14. Matos MFD, Silva NAS, Pimenta AJM et al. Prevalência dos fatores de risco para doença cardiovascular em funcionários do centro de pesquisas da Petrobrás. Arq Bras Cardiol 2004; 82(1):1-4.

15. Jenei Z, Pall D, Katona E et al. The epidemiology of hypertension and its associated risk factors in the city of Debrecen, Hungary. Public Health 2002; 116(3):138-44.

16. Chor D. Hipertensão arterial entre funcionários de banco estatal no Rio de Janeiro. Hábitos de vida e tratamento. Arq Bras Cardiol 1998; 71(5):653-60.

17. Shapo L, Pomerleau J, McKee M. Epidemiology of hypertension and associated cardiovascular risk factors in a country in transition: a population based survey in Tirana City, Albania. J Epidemiol Community Health 2003; 57:734-39.

18. Pickering TG. Lifestyle modification and blood pressure control: is the glass half full or half empty? JAMA 2003; 289(16):2131-32.

19. Xin X, He J, Frontini MG et al. Effects of alcohol reduction on blood pressure: a meta-analysis of randomized controlled trials. Hypertension 2001; 38(5):1112-17.

20. Okubo Y, Suwazono Y, Kobayzshi E et al. Alcohol consumption and blood pressure change: 5-year follow-up study of the association in normotensive workers. J Hum Hypertens 2001; 15(6):367-72.