

**TRACKING OF HIGH BLOOD PRESSURE AND ASSOCIATED RISK FACTORS IN
THE UNIVERSITY COMMUNITY****RASTREAMENTO DA PRESSÃO ARTERIAL ELEVADA E FATORES DE RISCOS
ASSOCIADOS EM COMUNIDADE UNIVERSITÁRIA****SEGUIMIENTO DE LA HIPERTENSIÓN ARTERIAL Y LOS FACTORES DE
RIESGO ASOCIADOS EN UNA COMUNIDAD UNIVERSITARIA**

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How to cite this article: Aguiar LA, Lima MDF, Magnabosco P, Raponi MBG, Sae MCS, Figueiredo VN. Tracking of high blood pressure and associated risk factors in the university community. Rev Enferm Atenção Saúde [Internet]. 2022 [access: ____]; 11(2):e202248. DOI: <https://doi.org/10.18554/reas.v11i2.4936>

ABSTRACT

Objective: Tracking, in a university young/adult community, blood pressure values and their association with cardiovascular risk factors. **Method:** Cross-sectional study, conducted with 270 students and 28 professors/administrative technicians at a public university in the interior of Minas Gerais-Brazil. Anthropometric and blood pressure measurements were performed, in addition to socio-demographic/clinical data and life habits collected. Bivariate analyses were performed. **Results:** The average age of students and teachers/technicians were, respectively, 23±5 years and 43±7 years, with prevalence of female (75%). Seventy percent of participants were classified as normotensive and 30% as elevated blood pressure, 93% being pre-hypertensive and 7% hypertensive. The mean systolic/diastolic blood pressure and body mass index were higher in participants who were identified as having elevated blood pressure ($p<0.05$). Cardiovascular risk factors were not associated with elevated blood pressure levels ($p>0.05$). **Conclusion:** A high rate of pre-hypertension was observed in the university community.

Descriptors: Arterial Pressure, Students; Heart Disease Risk Factors; Faculty.

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RESUMO

Objetivo: Rastrear, em uma comunidade adulta/jovem universitária, valores de pressão arterial e sua associação com fatores de risco cardiovascular. **Método:** Estudo transversal, realizado com 270 estudantes e 28 professores/técnicos administrativos em uma universidade pública do interior de Minas Gerais-Brasil. Medidas antropométricas e da pressão arterial foram realizadas, além de dados sociodemográficos/clínicos e hábitos de vida coletados. Análises bivariadas foram realizadas. **Resultados:** A média da idade dos estudantes e professores/técnicos administrativos foram, respectivamente, 23±5anos e 43±7anos, com prevalência do sexo feminino (75%). Setenta por cento dos participantes foram classificados como normotensos e 30% como pressão arterial elevada, sendo 93% pré-hipertensos e 7% hipertensos. A média da pressão arterial sistólica/diastólica e índice de massa corpórea foram maiores nos participantes com pressão arterial elevada ($p<0,05$). Os fatores de risco cardiovascular não apresentaram associação com a pressão arterial elevada ($p>0,05$). **Conclusão:** Alta taxa de pré-hipertensão foi observada na comunidade universitária. **Descritores:** Pressão arterial; Estudantes; Fatores de Risco de Doenças Cardíacas; Docentes.

RESUMEN

Objetivo: estudiar, en una comunidad universitaria de adultos/jóvenes, los valores de presión arterial y su asociación con factores de riesgo cardiovascular. **Método:** estudio transversal, realizado con 270 estudiantes y 28 profesores/técnicos administrativos de una universidad pública del interior de Minas Gerais-Brasil. Se hicieron mediciones antropométricas y de presión arterial, además se recolectaron datos sociodemográficos/clínicos y hábitos de vida. Se realizaron análisis bivariados. **Resultados:** la edad promedio de los estudiantes y profesores/técnicos administrativos fue, respectivamente, 23 ± 5 años y 43 ± 7 años, predominó el sexo femenino (75%). El setenta por ciento de los participantes fue clasificado como normotenso y el 30% como con presión arterial alta, de los cuales el 93% eran prehipertensos y el 7% hipertensos. La presión arterial sistólica/diastólica media y el índice de masa corporal fueron más altos en los participantes con presión arterial alta ($p < 0,05$). Los factores de riesgo cardiovascular no se asociaron con niveles elevados de presión arterial ($p > 0,05$). **Conclusión:** se observó una alta tasa de prehipertensión en la comunidad universitaria. **Descriptor:** Presión Arterial, Estudiantes. Factores de Riesgo de Enfermedad Cardíaca; Docentes.

INTRODUCTION

Systemic arterial hypertension (SAH) is considered a relevant public health problem worldwide, due to the high incidence rates (around 1.2 billion participants), morbidity and mortality. It is characterized by an elevation of blood pressure levels of ≥ 140 and/or 90 mmHg (SBC, 2016)¹, in addition to being the main contributing factor for all causes of death and disability, as well as an important

predisposing factor for cardiovascular diseases (CVD; including coronary heart disease, heart failure, stroke, myocardial infarction, atrial fibrillation, and peripheral artery disease), chronic kidney disease, and cognitive impairment.²

Among the risk factors for SAH, there are increased age (aging), sedentary lifestyle, body mass index (BMI), high waist-hip ratio (WHR), unhealthy diet, extra salt intake, diabetes, high cholesterol, stress,

alcohol and tobacco use.³ It is also noteworthy that less than half of people with SAH are aware of their condition, and its detection is associated with a decrease in premature mortality, as well as a reduction in complications.⁴

Studies carried out with university students have identified a high prevalence of cardiovascular risk factors and cardiometabolic abnormalities.^{5,6} In this context, considering that the university community has an increased risk for SAH, the detection of hypertension is a key element among strategies to reduce its consequences. Therefore, the objective of this study was to verify the risk factors associated with high blood pressure levels among university students, professors and administrative technicians.

METHOD

Study type and location

This is an observational, cross-sectional study with a quantitative approach, carried out at a public university in the interior of Minas Gerais, Brazil.

Research participants

The study population consisted of 298 participants, being 14 professors, 14 administrative technicians and 270 undergraduate nursing students, calculated based on the evaluation of the population

proportion of the total of professors, administrative technicians and students of the course (n=439). Sampling was proportional stratified random using the Microsoft Excel program. Individuals of both genders, linked to an educational institution, aged 18 years or older, without previous diagnosis of SAH and/or using antihypertensive medication were included.

Data collect

Data collection took place between August 2018 and February 2019 on the university premises, during breaks in academic activities. All participants gave written consent prior to inclusion in the study, which was approved by the local Ethics Committee. The participants were submitted to weight, height, abdominal and hip circumference, blood pressure measurement, and application of a data collection instrument in private places. A data collection instrument was used, developed by the researchers themselves, composed of sociodemographic data (gender, age, self-defined race, marital status, and student or teacher/administrative technician category), clinical data (weight, height, waist and hip circumference, blood pressure, heart rate, comorbidities, and family history), and lifestyle habits (smoking, sedentary lifestyle, alcoholism, and extra use of salt).

For weight measurement, a digital electronic scale, platform type, brand Omron HBF-214 was used, with a capacity of 150 kg and sensitivity of 50 g. Height was measured with the aid of an inextensible tape measure on a wall at ninety degrees from the floor, without skirting boards, with the participant in the proper position to assess this data. BMI was calculated using the weight (kg)/height² (m) ratio. The BMI division ranges considered were: normal when BMI between 18.5 and 24.9 Kg/m², overweight when BMI between 25 and 29.9 Kg/m² and obesity when BMI \geq 30 Kg/m². Measurements of waist circumference (WC) (at the umbilical scar height) and hip circumference (HC) (largest diameter portion) were also performed using an inextensible tape measure. To calculate the WHR, the WC divided by the HC was used – both in centimeters (cm).

To measure blood pressure (BP) automatic portable devices (model HEM-7113 Omron) and cuffs suitable for arm circumference were used. BP checks were performed according to the 7th Brazilian Guidelines on Arterial Hypertension (7th DBHA), with the participant in a sitting position, resting for 5 minutes, feet flat on the floor, legs uncrossed, bladder empty, arm extended at the fourth intercostal space, resting on a flat solid surface and the palm of the hand facing up. All participants

underwent three BP measurements, with an interval of one minute between them, with the average of the values of the last two BP measurements being considered the participant's BP. The PA classification was in accordance with the guidelines established in the 7th DBHA, that is, normotension when systolic blood pressure (SBP) \leq 120mmHg and diastolic blood pressure (DBP) 80mmHg, prehypertension when SBP blood pressure values were between 121 and 139 mmHg and/or DBP were between 81 and 89 mmHg and hypertension when SBP pressure values were \geq 140mmHg and DBP 90mmHg.¹ This study was carried out for the purpose of tracking blood pressure values, and not for a clinical diagnosis. With this, in cases of changes in the reference pressure values, the participant was instructed to seek the health service.

Smokers were defined as those who consumed at least one cigarette a day for a period of not less than one month, or those who had quit smoking less than one month earlier.⁷ Physical inactivity was defined as noncompliance with the global recommendations on physical activity for health.⁸ All those who reported using alcoholic beverages were considered to be heavy drinkers, regardless of the type, amount, or frequency.⁹ The extra use of salt was considered in the variables use of salt in

the preparation of meals and addition of salt to prepared meals (or use of salt shaker at the table).¹⁰

Data analysis

The collected data were organized in a spreadsheet in Excel®, validated by double typing and later exported to the Statistical Package for Social Science (SPSS), version 22.0. Descriptive analysis was performed through the distribution of absolute frequencies and percentages for categorical variables and measures of central tendency (mean and median) and variability (amplitudes and standard deviation) for quantitative variables. Comparisons between the dependent variable (high BP) and quantitative independent variables were studied using the Student t test. The associations between qualitative variables (gender, belonging category, overweight, diabetes, smoker, use of alcohol, use of salt in seasoning, salt shaker on the table, stress, regular physical exercise, WHR and family

history of SAH) were studied using Pearson's chi-square test. The inferential analyzes considered a significance level of 5% ($\alpha=0.05$).

All ethical and legal principles that govern research in human beings were complied with, recommended in the Resolution of the National Health Council No. UFU) No. 2,451,577 and Certificate of Presentation for Ethical Assessment (CAAE) No. 76727017.9.0000.5152.

RESULTS

A total of 270 students and 28 professors/administrative technicians with mean (SD) age of 23 ± 5 years and 43 ± 7 years, respectively, were included. The prevalence was observed as female (75%), white (50%) and single (85%). Table 1 shows the sociodemographic/clinical characterization and life habits of the academic community distributed by the BP classification.

Table 1. Sociodemographic/clinical characterization and life habits of the academic community distributed by blood pressure classification (n=298). Uberlândia, Minas Gerais, Brazil, 2018

	Total (n=298)	Normotensive (n=209)	Pre-hypertensive (n=83)	Hypertensive (n=6)
Female gender, n (%)	225 (100%)	164 (78%)	57 (69%)	4 (67%)
Age, n (%)				
< 20 years	45 (100%)	31 (69%)	14 (31%)	-
20 - 25 years	173 (100%)	120 (69%)	50 (29%)	3 (2%)
26 - 35 years	46 (100%)	33 (72%)	11 (24%)	2 (4%)
36 - 45 years	22 (100%)	19 (86%)	3 (14%)	-
46 - 59 years	11 (100%)	5 (45%)	5 (45%)	1 (9%)
>60 years	1 (100%)	-	-	1 (100%)
Caucasians, n (%)	149 (100%)	103 (69%)	42 (28%)	4 (3%)
Single, n (%)	252 (100%)	179 (71%)	69 (27%)	4 (2%)
Students, n (%)	270 (100%)	189 (70%)	76 (28%)	5 (2%)
Professor/Adm. Technician, n (%)	28 (100%)	19 (68%)	7 (25%)	1 (3%)
BMI, kg/m ²	-	23±3	24±4*	24±4
BMI, n (%)				
18.5 - 24.9 Kg/m ²	207 (100%)	148 (71%)	55 (27%)	4 (2%)
25 - 29.9 Kg/m ²	69 (100%)	47(68%)	20 (29%)	2 (3%)
30 - 34.9 kg/m ²	18 (100%)	10 (56%)	8 (44%)	-
AC, cm	-	74±9	75±8	74±8
Altered WHR, n (%)	45 (100%)	32 (71%)	13 (29%)	-
SBP, mmHg	-	108±8	124±5*	131±9#
DBP, mmHg	-	66±6	72±7*	89±4#
Waist/hip ratio, cm	-	0.76±0.07	0.77±0.06	0.74±0.03
Diabetes, n (%)	5 (100%)	2 (40%)	2 (40%)	1 (20%)
Smoker, n (%)	18 (100%)	14 (78%)	4 (22%)	-
Use of alcohol, n (%)	126 (100%)	88 (70%)	35 (28%)	3 (2%)
Use of Salt in Meal Preparation, n (%)	245 (100%)	173 (71%)	67 (27%)	5 (2%)
Salt shaker on the table, n (%)	67 (100%)	44 (66%)	21 (31%)	2 (3%)
Stress, n (%)	165 (100%)	115 (70%)	45 (27%)	5 (3%)
Regular physical exercise, n (%)	139 (100%)	100 (72%)	38 (27%)	1(1%)
Family history of SAH, n (%)	171 (100%)	121 (71%)	46 (27%)	4 (2%)

Values are expressed as n (percentage) or mean (SD). BMI: body mass index; AC: abdominal circumference; WHR: waist-hip ratio; SBP: systolic blood pressure; DBP: diastolic blood pressure; SAH: systemic arterial hypertension.

*normotensive versus prehypertensive

#normotensive versus hypertensive

There were 209 (70%) normotensive participants, 83 (28%) pre-hypertensive participants and 6 (2%) hypertensive participants. Differences in SBP and DBP values were observed in prehypertensive and hypertensive participants when compared with normotensive ($p=0.001$) (Table 1). The mean BMI of prehypertensive participants

was higher when compared to normotensive ones (24 ± 3.8 kg/m² and 23 ± 3.3 kg/m² $p<0.05$, respectively). Of the 50 pre-hypertensive and hypertensive participants with a family history of SAH, 74% reported the presence of only one hypertensive family member (father or mother or one of the grandparents), 18% two hypertensive family members (father or mother, and one

of the grandparents) and 8% three hypertensive family members (father and mother, and one of the grandparents).

characteristics and life habits of the participants with the BP classification (Table 2).

There was no association among sociodemographic and clinical

Table 2 -Association among sociodemographic and clinical variables, lifestyle habits and blood pressure classification in an academic community (N=298), Uberlândia, Minas Gerais, Brazil 2018

	Normotensive (n=209)	High AP (n=89)	P
Gender			
Feminine	164 (73%)	61 (27%)	0.069
Male	45 (62%)	28 (38%)	
Category			
Student	189 (70%)	81 (30%)	0.875
Professor/Adm.	20 (71%)	8 (29%)	
White color			
Yes	106 (71%)	43 (29%)	0.705
No	103 (69%)	46 (31%)	
Overweight			
No	148 (71%)	59 (28%)	0.309
Yes	57 (65%)	30 (34%)	
Diabetes			
No	207 (71%)	86 (29%)	0.138
Yes	2 (40%)	3 (60%)	
Smoker			
No	195 (70%)	85 (30%)	0.466
Yes	14 (78%)	4 (22%)	
Alcohol use			
No	119 (70%)	51 (30%)	0.355
Yes	88 (70%)	38 (30%)	
Use of Salt in Seasoning			
No	36 (68%)	17 (32%)	0.699
Yes	173 (71%)	72 (29%)	
Salt shaker on the table			
No	165 (71%)	66 (29%)	0.365
Yes	44 (66%)	23 (34%)	
Stress			
No	94 (71%)	39 (29%)	0.854
Yes	115 (70%)	50 (30%)	
Regular physical exercise			
Yes	100 (72%)	39 (28%)	0.524
No	109 (69%)	50 (31%)	
WHR			
Normal	176 (70%)	76 (30%)	0.864
High	32 (71%)	13 (29%)	
Family history of SAH			
No	89 (69%)	40 (31%)	0.675
Yes	120 (71%)	49 (29%)	

BMI: body mass index; SAH: systemic arterial hypertension; WHR: waist-to-hip ratio.

DISCUSSION

In a cross-sectional study, researchers observed a rate of 6.5% of SAH in the university population (n=184), with a prevalence of males.¹¹ Unlike this study in which there was a predominance of females, a fact that may be associated with the predominance of the female gender in the nursing profession. A systematic review study showed that ethnicity and socioeconomic factors are not important influences on SAH detection rates, but social isolation may be associated with a lower detection rate.¹² In this study, the prevalence of single marital status (82%) was observed in the population with high blood pressure values, which can be inferred with the findings mentioned above.

Of the total population of this study, there was a rate of 28% of participants with BP values corresponding to pre-hypertensive classification and 2% as hypertensive. Pre-SAH, an intermediate stage between normotension and SAH, is associated with subclinical atherosclerosis and lesions in target organs; however, its prevalence is underreported due to its silent nature.¹³ Increased age, overweight, and elevated systolic BP are predictors of pre-HSA.¹³ These data corroborate the findings of this study, in which the pre-hypertensive group had higher BMI and BP values when

compared to the normotensive group. Excess weight is an important risk factor for SAH worldwide. A longitudinal study with approximately 5-year follow-up of prehypertensive young adults indicated that a BMI of 25-30 kg/m² and a BMI > 30 kg/m² were associated with an 83% and 162% increased risk of SAH, respectively.¹⁴

A review study shows that the incidence of SAH is increasing and factors associated with lifestyle, such as increased salt intake, smoking, obesity, unhealthy diets, physical inactivity, alcohol consumption and psychosocial stress, play a decisive role in this development.¹⁵ In this study, despite the non-association of lifestyle habits with high BP values, the prevalence of the following modifiable risk factors was observed: use of salt as a seasoning, stress and lack of regular physical exercise, and risk factor not modifiable: family history of SAH in the high BP group. It is known that recommendations for sodium restriction largely depend on BP. A meta-analysis study showed that the greater the reduction in salt intake, the greater the decrease in SBP; that is, a long-term reduction of 6 g/day in salt intake predicted a 5.8 mmHg decrease in SBP after adjusting for age, ethnic group, and BP status.¹⁶

In this study, approximately 50% of the total population reported having stress, and 30% of them had high blood pressure. Acute psycho-emotional stress is one of the causes of a marked increase in BP. In a recent meta-analysis, chronic psychosocial stress was associated with an increased risk for SAH (OR = 2.40, 95% CI = 1.65-3.49), and hypertensive participants had a higher incidence of psychosocial stress compared to normotensive individuals. (OR = 2.69, 95% CI = 2.32-3.11).¹⁷

Another relevant data from this study was that 53% of the total population does not practice regular physical exercise. It is known that a sedentary lifestyle increases excess weight and converges to an increase in the abdominal waist, metabolic syndrome and insulin resistance, culminating in an increase in BP. A systematic review study, which included fourteen observational studies that addressed the prevalence of high BP in children and adolescents showed that the most prevalent risk factor was a sedentary lifestyle (50%, range: 36.3% - 61%).¹⁸ Furthermore, the association between time spent in sedentary behaviors and BP indicated that an additional hour spent in sedentary behaviors per day was associated with an increase in SBP by 0.06 mmHg (95% CI 0.01-0.11 , p = 0.01) and DBP at 0.20 mmHg (95% CI 0.10-0.29, p <0.001).¹⁹

Family history of SAH is a risk factor for the development of SAH. In this study, 57% of the participants had a family history of SAH, and 29% had high blood pressure. A prospective study observed that participants with a family history of SAH in both parents and one or more grandparents had an odds ratio of 3.05 (95% CI 1.74-5.36, p<0.001) for SAH compared with those with no family history of SAH, that is, SAH over two generations, with both parents affected, was the most important risk factor for incident SAH.²⁰ This finding was observed in a lower prevalence in this study, in which 8% of the participants with high BP fit this question.

Study limitation

The current study has some limitations. First, as it is a cross-sectional study, it was not able to establish a cause and effect relationship between risk factors and high blood pressure. Second, participants may have had memory bias when answering the questionnaire, resulting in a difference in the information provided. Finally, the BP measurement was performed in a single moment and without the subsequent diagnostic finding of the participants who presented altered BP.

CONCLUSION

In conclusion, this study suggests a high prevalence of prehypertension and hypertension in a university community aged 18 to 35 years, which may be predictive of a high incidence of future cardiovascular disease events. In addition to the need for further studies to accurately explore cardiovascular risk indicators in this population, intervention programs aimed at pre-hypertensive individuals to raise awareness about the prevention of SAH are necessary.

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95(38):e4564.
doi:10.1097/MD.0000000000004564

RECEIVED: 09/14/20
APPROVED: 09/23/22
PUBLISHED: Oct/22