

## CHANGE IN BLOOD PRESSURE LEVELS IN COLLEGE STUDENTS

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**ABSTRACT:** The aim in this study was to evaluate the pressure levels in college students and their relation with socioeconomic level, lifestyle and biochemical data. This is a descriptive, cross-sectional study, conducted with 550 students from a public university in Picos-PI, in 2013. A form containing socioeconomic data, lifestyle, waist circumference, blood pressure, fasting serum glucose, triglycerides and HDL-cholesterol was applied. We observed elevated blood pressure levels in 21.5% of males and 2.2% of females, with significant representation ( $p < 0.0001$ ). There was a statistically significant association for smoking ( $p < 0.0001$ ) and alcohol consumption ( $p < 0.0001$ ) with systolic and diastolic blood pressure, as well as for waist circumference ( $p = 0.0039$ ). When considering the quality of life for the coming years, it is important to note the need to implement measures that promote changes in lifestyle with the acquisition of healthy habits.

**DESCRIPTORS:** Students. Risk factors. Arterial pressure.

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## ALTERAÇÃO DOS NÍVEIS DE PRESSÃO ARTERIAL EM UNIVERSITÁRIOS

**RESUMO:** Objetivou-se avaliar os níveis pressóricos em universitários e sua relação com o nível socioeconômico, o estilo de vida e os dados bioquímicos. Trata-se de um estudo descritivo, transversal, desenvolvido com 550 estudantes de uma universidade pública de Picos-PI, em 2013. Foi aplicado um formulário contendo dados socioeconômicos, estilo de vida, medida da circunferência abdominal, pressão arterial, níveis séricos de glicemia de jejum, triglicérides e HDL-colesterol. Observaram-se níveis pressóricos elevados em 21,5% do sexo masculino e 2,2% nas mulheres, com representação significativa ( $p < 0,0001$ ). Houve associação estatisticamente significativa para o tabagismo ( $p < 0,0001$ ) e para o consumo de álcool ( $p < 0,0001$ ) com a pressão arterial sistólica e diastólica, bem como para a circunferência abdominal ( $p = 0,0039$ ). Assim, pensando na qualidade de vida dos próximos anos, é importante observar a necessidade de implementação de medidas que promovam mudanças no estilo de vida com aquisição de hábitos saudáveis.

**DESCRIPTORIOS:** Estudantes. Fatores de risco. Pressão arterial.

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## CAMBIO EN LOS NIVELES DE LA PRESIÓN ARTERIAL DE UNIVERSITARIOS

**RESUMEN:** El objetivo fue evaluar los niveles de presión arterial en estudiantes y su relación con el nivel socioeconómico, estilo de vida y datos bioquímicos. Estudio descriptivo, transversal, desarrollado con 550 estudiantes de una universidad pública de Picos-PI, Brasil, en 2013. Se aplicó formulario con informaciones socioeconómicas, estilo de vida, medición de la circunferencia de la cintura, presión arterial, niveles de glucosa en suero en ayunas, triglicéridos y HDL-colesterol. Fueron observados altos niveles de presión arterial en 21,5% de los hombres y 2,2% de las mujeres, con representación significativa ( $p < 0,0001$ ). Hubo asociación estadísticamente significativa con tabaquismo ( $p < 0,0001$ ) y consumo de alcohol ( $p < 0,0001$ ), con presión arterial sistólica y diastólica, y también como para circunferencia de la cintura ( $p = 0,0039$ ). Así, para la calidad de vida en los próximos años, es preciso implementar medidas para promover cambios en el estilo de vida con adquisición de hábitos saludables.

**DESCRIPTORIOS:** Estudiantes. Factores de riesgo. Presión arterial.

## INTRODUCTION

Despite constant stimuli to adopt healthy life practices and the growing therapeutic arsenal, cardiovascular diseases are still the main cause of morbidity and mortality in developed and emerging countries.<sup>1</sup> Data from the Ministry of Health appoint that, today, chronic conditions are responsible for 72% of the causes of death in Brazil.<sup>2</sup> Arterial hypertension (AH) is one of the main risk factors for the worsening of this scenario, estimating that 25.5% of women and 20.7% of men aged  $\geq 18$  years have blood pressure (BP) levels superior to normal parameters.<sup>3</sup>

Due to the high morbidity and mortality and negative repercussions for the quality of life, and due to their socioeconomic impact, the chronic conditions are a source of concern and lead to the identification of the need to implement public policies to raise the population's awareness about the main cardiovascular risk factors, as these conditions represent health problems that require continuous management by the patients over a long period.<sup>4</sup>

These factors can be verified in different populations, including college students. Upon getting into college, students go through different lifestyle changes that can favor the emergence of one or several risk factors for AH and other chronic conditions, such as increasingly insufficient physical exercise, consumption of substances like tobacco and alcoholic beverages and bad eating habits.<sup>5-6</sup>

It is important to highlight that, among college students, a high prevalence of cardiovascular risk factors is observed, which is a source of concern, as this group has access to information and is expected to serve as a model for the establishment of healthy life habits for the general population.<sup>7-8</sup> The objective in this study was to assess the pressure levels in college students and their relation with the socioeconomic level, lifestyle and biochemical data.

## METHOD

A descriptive and cross-sectional study was developed with college students from a public university in a city in the interior of Piauí, Brazil.

The study population consisted of 2,868 male and female college students enrolled at the place of study. For the sample size, a formula was used for finite populations, resulting in 550 participants. A stratified sampling process was applied per course and graduation period by response to the

invitation. The data were collected between January and March 2013.

The selection of the participants complied with the following inclusion criteria: being actively enrolled in one of the university's nine courses, age 18 years or older, and participating in all phases of the research.

Students present in the classroom were invited. On that occasion, the research objectives were explained, as well as what each student should do in participating, such as filling out a form with socioeconomic data, lifestyle including bad habits like smoking, drinking, and healthy habits like physical exercise. The waist circumference (WC) and BP were measured and blood was collected to assess the serum levels of venous glucose, triglycerides and HDL-cholesterol (with 12 hours of fasting). A laboratory was hired for the collection and biochemical analyses. The entire data collection took place at the university in a room booked in advance.

As to the lifestyle, students who did not practice at least 30 minutes per day of light or moderate activity five days per week were classified as sedentary; or 20 minutes per day of intense activity three or more days per week. Light or moderate activities are considered as: walking, walking on treadmill, bodybuilding, water gymnastics, gymnastics in general, swimming, martial arts, cycling and volleyball. Intense activities are: running, running on treadmill, aerobics, soccer, basketball and tennis.<sup>9</sup>

What smoking is concerned, the students were classified in four categories: daily smoking, occasional smokers, former smokers and non-smokers. Daily smokers were considered to be people who smoked at least one cigarette per day, one month before completing the questionnaire; occasional smokers were people who did not smoke daily; former smokers were people who, after having smoked, quit smoking at least one month earlier; and non-smokers were people who had never smoked or had been smoking for less than one month.<sup>10</sup>

As for drinking, the Alcohol Use Disorders Identification Test (AUDIT) was used as a measure, which is a ten-question test developed by the World Health Organization as a screening tool, specifically to identify people with harmful alcohol consumption, as well as people who have already developed an addiction. The version adapted for Brazil was used.<sup>11-12</sup>

The variables: waist circumference, triglycerides, HDL-cholesterol and fasting glucose were

analyzed according to the recommendations of the Brazilian Society of Cardiology,<sup>13</sup> and the pressure levels according to the VI Brazilian Hypertension Guidelines.<sup>14</sup>

The data were analyzed through the Statistical Package for the Social Sciences (SPSS), version 20.0. For the descriptive analysis, absolute and relative frequencies were calculated, as well as central trend and dispersion measures. The Kolmogorov-Smirnov test was applied to assess the normality of the sample. Pearson's Chi-square and the Fisher-Freeman-Halton test were applied to check for discrepancies between the observed and expected frequencies of the events studied. The rejection level established for the null hypothesis was lower than or equal to 0.05 (5%).

The development of the study followed the Brazilian and international ethical standards for research involving human beings and received approval from the Institutional Review Board of the *Universidade Federal do Piauí*, under protocol n. 0408.0.045.000-11. Project funded by the call of the Infrastructure Program for Young Researchers of the Piauí Research Foundation.

## RESULTS

The research involved 550 college students from the Bachelor programs in Nursing, Nutrition, Administration, Information Systems and Teaching Diploma programs in Mathematics, Pedagogics, Languages, History and Biology.

As regards the sample characteristics, what the socioeconomic data are concerned, 66.2% were female, 85.1% were between 18 and 25 years of age, with an average age of 22.6 years. The most predominant self-referred color was mulatto, corresponding to 51.6%. As to the employment situation, 69.3% only studied. What the economic class is concerned, 51.8% were classified between classes C1 and C2, with a mean income of R\$1,629.00. The large majority of the students (86.7%) were single, and 39.6% lived with their parents.

What the practice of physical exercise is concerned, it is highlighted that 71.7% were sedentary. As for smoking, 91.8% affirmed that they never smoked or were smoking for less than one month. And, regarding the drinking variable, 48.5% were classified in zone II, of medium risk.

The anthropometric data, pressure levels and biochemical data for the sample have been described in Table 1.

**Table 1 - Anthropometric data, pressure levels and biochemical data among students from a public university. Picos-PI, 2013**

Variables	n	%	Mean ±SD*
Waist circumference			78.3±10.3
Normal	518	94.2	
High	32	5.8	
Fasting glucose			83.3±11.9
Normal	543	98.7	
High	7	1.3	
Triglycerides			122.2±55.0
Normal	446	81.1	
High	104	18.9	
HDL <sup>†</sup> cholesterol			43.9±8.0
Normal	195	35.5	
Low	355	64.5	
Blood pressure			SBP <sup>‡</sup> : 109.9±12.1
Excellent	369	67.1	DBP <sup>§</sup> : 69.9±9.7
Normal	133	24.2	
Borderline	48	8.7	

\*Standard Deviation;†High Density Lipoprotein; ‡SBP - Systolic Blood Pressure; §DBP - Diastolic Blood Pressure.

Concerning the variable WC, 94.2% complied with normal parameters, and 5.8% were classified as high (mean 78.3 cm). 98.7% had their fasting glucose within normal parameters and only 1.3% for high glucose (mean 83.3 mg/dl). What the triglyceride level is concerned, 18.9% of the sample showed higher than ideal parameters (mean 122.2 mg/dl); Regarding HDL-cholesterol levels, 64.5% presented low levels (mean 43.9 mg/dl), and 8.7% revealed borderline BP levels (mean SBP 109.9 mmHg and DBP 69.9 mmHg).

Table 2 displays the stratification of BP per sex, age range and economic class.

**Table 2 - Stratification of blood pressure variable per sex, age range and economic class of students at a public university. Picos-PI, 2013**

Variables	Blood pressure				p
	Normal		High		
	n	%	n	%	
Sex					<0.0001*
Female	356	97.8	8	2.2	
Male	146	78.5	40	21.5	
Age range					<0.0001*
18-25	430	91.8	38	8.2	
26-51	72	87.8	10	12.2	
Economic class					SBP: 0.003*
A-B	171	86.8	26	13.2	DBP: 1.000*
C-D-E	331	93.8	22	6.2	

\*Chi-Squared

When associating the socioeconomic variables with the BP, 21.5% of the male students showed high BP. The predominant age range was between 26 and 51 years old, with 12.2% presenting high BP levels. Significant representations were found for sex ( $p < 0.0001$ ) and age range ( $p < 0.0001$ ) in relation to SBP and DBP, and an association between economic class ( $p = 0.003$ ) and SBP.

Table 3 demonstrates the association between lifestyle (drinking, smoking and exercising) and BP.

**Table 3 – Association between lifestyle (drinking, smoking and physical exercise) and blood pressure of students at a public university. Picos-PI, 2013**

Variables	Blood pressure				p
	Normal		High		
	n	%	n	%	
Physical exercise					>0,532*
Active	136	87,7	19	12,3	
Sedentary	376	95,2	19	4,8	
Smoking					<0,0001*
Daily or occasional smokers	39	86,7	6	13,3	
Never smoked or smoking for less than one month	463	91,7	42	8,3	
Drinking					<0,0001*
Zone I – Zone II	425	91,5	39	8,5	
Zone III – Zone IV	77	89,5	9	10,5	

\*Chi-Squared

It was verified that 4.8% of the sedentary individuals had increased BP. As regards smoking, 13.3% were considered daily or occasional smokers, with high pressure levels. Concerning alcohol use among the students, between zones II and IV, 10.5% of students with high BP levels were found. A statistically significant association was found for smoking ( $p < 0.0001$ ) and drinking ( $p < 0.0001$ ) with SBP and DBP.

Table 4 displays the association between BP data and other components of the Metabolic Syndrome (MS) according to the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III).

**Table 4 – Association between blood pressure and anthropometric and biochemical data of students at a public university. Picos-PI, 2013**

Variables	Blood pressure				p
	Normal		High		
	n	%	n	%	
Waist circumference					0.0039*
Normal	478	92.3	40	7.7	
High	24	75.0	8	25.0	
Fasting glucose					0.4742*
Normal	496	91.4	47	8.6	
High	6	85.7	1	14.3	
Triglycerides					0.0575†
Normal	412	92.3	34	7.7	
High	90	86.6	14	13.4	
HDL <sup>‡</sup> Cholesterol					1.000†
Normal	169	86.7	26	13.3	
Low	333	93.8	22	6.2	

\*Fisher-Freeman-Halton; †Chi-Squared; ‡High Density Lipoprotein

When associating BP with waist circumference, glucose, triglycerides, HDL-cholesterol, it was observed that 25.0% of the students had high waist circumference and pressure levels; 14.3% of the high glucose levels belonged to students with high BP levels; 13.4% of the college students stood out with high triglycerides and BP; 6.2% of the sample presented low plasma levels of HDL-cholesterol and above-normal BP. Statistical significance was found for waist circumference only ( $p = 0.0039$ ).

## DISCUSSION

It was verified that most research participants were female. Concerning this variable, this finding may be related to the fact that women represent a majority in society<sup>15</sup> and are also the most frequent sex in research samples involving college students.<sup>16-18</sup> As for age, the most prevalent age range was between 18 and 25 years, the expected range for studies in this population, with results similar to other studies.<sup>18</sup>

In the association of the independent variables (sex, age range and economic class) to BP, it was observed that the male population prevailed

in the age range between 26 and 51 years. In the interpretation of the data, it was verified that the prevalence of high pressure levels in men in this age range who belonged to the groups with high purchasing power can be determined by the academic life behavior, such as: sedentariness, smoking and harmful alcohol consumption.

Concerning physical exercise, significant levels of sedentariness were found. The characteristics associated with low levels of exercising among the college students are influenced by some factors, including sex, age, employment situation, economic characteristics (monthly income, social class and whom the student lives with) and life habits (dieting or not). High levels of sedentariness are more frequent in students who have been at university longer when compared to sophomores, indicating a downward trend in physical exercise.

In the assessment of the biochemical data (triglycerides, HDL-cholesterol, fasting glucose), important triglyceride levels superior to expectations (18.9%) and HDL-cholesterol below normal parameters (64.5%) were found. In a study in the United States involving 189 students,<sup>20</sup> it was identified that HDL-cholesterol was inferior to the suggested level in 20.1% and that the triglyceride levels were increased in 17.5% of the sample. The levels found here are higher and a source of concern for the college population with a view to the control of dyslipidemias.

The increased prevalence of BP in this public varies considerably. The result found here (8.7%) was intermediary, lower than that observed in a study involving 667 college students from Lubango, Angola, which found 23.5% of students with above-normal pressure levels.<sup>21</sup> On the other hand, it was higher than an analysis of 702 college students from Fortaleza-CE, which found 7.4% of students with increased blood pressure.<sup>18</sup>

Concerning the association between BP levels and sex, a higher prevalence of increased pressure levels was found among men than among women ( $p < 0.0001$ ). Findings from different studies indicate a lower prevalence of AH in women when compared to men up to the age of 55 years and, after that age, a significant increase of the disease occurs among women.<sup>8,21</sup>

As to the students' lifestyle, smoking and drinking should be highlighted, as both were associated with altered BP levels. The exacerbated consumption of alcohol and cigarettes are factors that predispose to health problems and the development of diseases, which are interdependent

elements that are hard to control.<sup>22</sup> Nevertheless, alcohol consumption mostly happened in the medium-risk zone (48.5%) and predominantly involved non-smokers (91.8%).

Several authors highlight the need for interventions in the academic context.<sup>23-24</sup> In an exploratory analysis at the University of Aveiro, Portugal, aiming to compare sophomores with veteran students, a higher percentage of smokers was demonstrated (19.3%) among students exposed to the academic life than among sophomores (0.0%), suggesting that a high education level does not seem to protect a healthier lifestyle.<sup>24</sup>

As regards drinking, 64.2% of the students consumed alcoholic beverages. Despite this high frequency, the majority who consumed alcohol was rated in the low and medium-risk zones. Lower rates can be observed in the literature, like in a study developed at Universidade Salgado de Oliveira, Goiânia Campus, involving 200 nursing students, which appointed that 53% of the students consumed alcohol, besides 36% of the students mentioned increased consumption after they had started college.<sup>25</sup>

In addition, a strong association was observed between central obesity and high pressure levels. Central obesity is an important risk factor for the development and progression of cardiovascular diseases, with clearly known harmful effects described by different authors,<sup>8</sup> besides the fact that the fat distribution is another important risk factor for obesity-related diseases.<sup>23</sup> Overweight with central fat deposits is a factor predisposing to high blood pressure. The prevalence of AH among obese people is higher when compared to non-obese individuals.<sup>21</sup>

The association between WC and AH was also analyzed in a similar study developed at Universidade Federal do Piauí, involving 605 students, when it was discovered that abdominal obesity was present in 2.4% of the students, independently of gender. A lower rate than that found in this study, with 5.8% of WC above normal standards.<sup>8</sup>

## CONCLUSION

Based on the analysis of the students' pressure levels, isolated cases above the ideal parameters were found, while participants with high BP simultaneously presented increased WC, associated with smoking and drinking ( $p < 0.05$ ). These findings evidence that, even in a young popula-

tion, the accumulation of fat in the organism and central obesity are important determinants in the increase of blood pressure levels. Concerning the socioeconomic data, an association was found with the variables: sex, age range and economic class ( $p < 0.05$ ). Nevertheless, no statistically significant association was found with the biochemical data.

One of the limitations in this study was the absence of statistical analysis that may infer on the cause and effect between high blood pressure and triggering factors, due to the impossibility of these analyses because of the cross-sectional design. Another limitation was not having investigated the students' institutional characteristics, such as the year of entry, class group and daily hours spent at college and associations with BP levels.

As the incidence and prevalence of chronic conditions increase considerably as age advances, it is important to execute prevention actions, so that these diseases are detected early, and to develop other studies to assess the strategies used, as well as the impact on this public's lifestyle.

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