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Original Article

# Relationship among anthropometric and hemodynamic variables in public servants of Sergipe

## Relação entre variáveis antropométricas e hemodinâmicas em servidores públicos de Sergipe

Patrícia Morgana Ferreira Santos[1], Lúcio Marques Vieira Souza[1,2], Jymmys Lopes dos Santos[2], Matheus Amarante do Nascimento[3], Clésio Andrade Lima[2], Ricardo Aurélio Carvalho Sampaio[4]

1. State Secretary of Education, Sport and Culture of Sergipe - SEDUC, Aracaju, SE, Brazil.
2. Postgraduate Program in Biotechnology, Federal University OF Sergipe - UFS, São Cristóvão, SE, Brazil.
3. Department of Physical Education, State University of Paraná - UNESPAR, Campus Paranavaí, Paranavaí, PR, Brazil.
4. Department of Physical Education, Federal University of Sergipe - UFS, São Cristóvão,SE, Brazil.

**ABSTRACT**

Physical activities have an important prophylactic effect against cardiovascular diseases, as they promote reduction in body weight and blood pressure levels, for example. Individuals working on administrative functions tend to be sedentary, with consequent risk of obesity. However, the relationship among anthropometric and hemodynamic variables is still inconsistent. Thus, the aim of this study was to analyze the correlation among anthropometric and hemodynamic parameters of public servants. This is an observational and cross-sectional study with a sample of 147 individuals. It was verified that normotensive men had higher body mass index than hypertensive men. In contrast, these individuals showed higher resting heart rate values. It was noted that none of the anthropometric variables were associated with systolic and diastolic blood pressure; the associations verified were among anthropometric variables (r = 0.738 - body weight and hip; and r = 0.936 - abdomen and waist circumference). Also, no associations among anthropometric variables, blood pressure indices and resting heart rate were observed. In conclusion, although anthropometric variables are good predictors of body adiposity, they are not necessarily related to hemodynamic variables. The practice of physical activities should be encouraged within work routines, at appropriate times, aiming to improve healthy habits and anthropometric indicators.

**Key-words:** Anthropometry, hemodynamics, public servants, cardiovascular risk, adiposity.

**RESUMO**

Atividades físicas têm importante efeito profilático contra doenças cardiovasculares, pois promovem redução do peso corporal e níveis pressóricos, por exemplo. Indivíduos que desenvolvem trabalhos administrativos têm tendência ao sedentarismo, com consequente risco de obesidade. No entanto, a relação entre medidas antropométricas e hemodinâmicas ainda é inconsistente. Assim, o objetivo deste trabalho foi analisar a correlação entre parâmetros antropométricos e hemodinâmicos de servidores públicos. É um estudo observacional e transversal com uma amostra de 147

Correspondence: Lúcio Marques Vieira Souza, Cidade Universitária "Prof. José Aloísio de Campos", Av. Marechal Rondon, s/n. Jardim Rosa Elze, 49100-000. São Cristóvão/SE. E-mail: profedf.luciomarkes@gmail.com

indivíduos. Verificou-se que homens normotensos apresentaram maiores médias de índice de massa corporal em relação aos hipertensos. Em contrapartida, esses indivíduos demonstraram maiores valores de frequência cardíaca em repouso. Notou-se que nenhuma das variáveis antropométricas foi associada à pressão arterial sistólica e diastólica, observando-se apenas associações das variáveis antropométricas entre si (r = 0,738 - peso corporal e quadril; e r = 0,936 - abdômen e circunferência de cintura). Portanto, não se observou associações entre variáveis antropométricas, índices pressóricos e frequência cardíaca de repouso. Conclui-se que, apesar das variáveis antropométricas serem boas preditoras de adiposidade corporal, não necessariamente são relacionadas com variáveis hemodinâmicas. A prática de atividade física deve ser estimulada dentro das rotinas laborais, em momentos oportunos, buscando incentivo a hábitos saudáveis e melhoria dos indicadores antropométricos..

**Palavras-chave:** Antropometria, Hemodinâmica, Servidores Públicos, Risco Cardiovascular, Adiposidade.

## Introduction

It is well known the positive effects of regular physical exercise on reducing the risk of chronic degenerative diseases, such as hypertension and diabetes [1,2]. Part of these effects are related to the decrease in blood pressure levels of obese individuals [3], including overweight young women [4], thus exercising beneficial prophylactic effects on hyperinsulinemic profiles [5].

Studies associated high rates of cardiovascular diseases to arterial hypertension [6-8] and overweight [9], which corroborate the high incidence in several countries around the world. It is also necessary to consider that large portion of the population spends part of their lives in the work environment and many of these jobs are potential triggers for sedentary behavior [10,11].

In the study by Parry and Straker [12], results showed that a part of individuals with productive lives, including those that involve office work activities, presented sedentary behavior in 82% of the hours; while those who were not at work had 62%. This leads to the need of formulating proposals that involve changes in habits, focusing on reducing sedentary behaviors, aiming at improving the cardiometabolic health of these people, with a consequent increase in quality of life [13].

In this context, there is still inconsistency in the relationship between overweight and obesity, verified through anthropometric measurements, and the risks of hypertension in men and women in different segments of workplace [14-16]. Evidence points out that there is a strict relationship between anthropometric variables and long-term cardiometabolic health [17], however, in Brazil, there is a scarcity of studies involving working environment, especially in the Northeastern part of the country.

Only few studies analyzed the associations among anthropometric variables related to parameters of cardiovascular health of individuals in the workplace. Thus, the objective of this study was to analyze the relationship among anthropometric variables and blood pressure in public servants of an executive branch of the state of Sergipe.

## Methods

### Design and subjects

This study had a cross-sectional observational design. The sample consisted of 147 individuals of both sexes, categorized according to blood pressure values (mean age: normotensive men 38.87 ± 10.49 years, hypertensive 41.64 ± 10.35 years; mean age: normotensive women 44.57 ± 9.98, hypertensive 39.81 ± 15.47 years). Participants were chosen at random from among various sectors of an executive branch of the State of Sergipe. As inclusion criterion, age range proposed for the study was from 19 to 61 years, aiming to cover the largest number possible of participants; however, the mean age found indicates subjects close to 40 years old. Data were collected by trained evaluators using previously calibrated equipment. Data collection occurred during office hours between 8 am and 11 am. Analyzed variables involved personal information (age and sex); anthropometric measures (body mass index [BMI], hip circumference [HC], waist circumference [WC] and waist to hip ratio [WHR]; hemodynamic conditions (systolic blood pressure [SBP], diastolic blood pressure [DBP] and resting heart rate [RHR]).

All volunteers were informed about the objectives of the study and research criteria involving human beings, following the guidelines of Resolution no 196/1996, updated in Resolution no 510/2016 of the National Health Council and gave their signed consent prior enrollment. The research was approved by the Research Ethics Committee of the Federal University of Sergipe (UFS), through process #41225414.4.0000.5546.

### Procedures

Age and sex were recorded using a questionnaire. Age was arranged in years, considering a decimal scale from the date of birth to the date of collection.

Body mass was measured on a scale with a maximum capacity of 150 kg and precision of 0.1 kg (G-Tech, Glass Pro), while height was measured with a standard stadiometer (Wiso®, Brazil), with an accuracy of 0.1 cm. WC was obtained using a non-extensible measuring tape, positioned immediately above the umbilical scar and the reading made at the time of expiration, according to recommended standards [18].

HC was measured in the region with the largest perimeter between the waist and the thigh [19]. The WHR was calculated using the ratio between WC and HC and classified according to the cutoff points previously described in the literature [20]. Nutritional status was established from the BMI, defined as the division of body mass (kg) by the square of height (m).

Regarding hemodynamic variables, SBP, DBP and RHR were measured. To measure the blood pressure, an automatic oscillometer blood pressure measuring equipment (Omron, HEM-7200, São José do Rio Preto, Brazil) was used. Thereafter, three consecutive blood pressure measurements were performed in which the difference in SBP and DBP values was a maximum of four millimeters of mercury (4 mmHg). For this, a minimum of one minute was respected between each measure. An optimum blood pressure value <120/80 mmHg and an altered value of ≥ 140/90 mmHg were considered. The procedures followed the

recommendations of the Brazilian Society of Hypertension [21].

### *Statistical analysis*

In statistical analysis, descriptive statistical methods of frequencies were used. Initially, data were analyzed based on the comparison between normotensive and hypertensive individuals, according to sex. Thus, the independent t test for parametric variables and the Mann-Whitney U test for non-parametric variables were adopted.

Lastly, Pearson and Spearman's binary correlations, when appropriate, were also performed, aiming to verify the correlation between the sample's anthropometric and hemodynamic variables. The statistical difference was established as $p < 0.05$. For all analyzes SPSS version 22 was used.

## Results

Table I shows the comparison between participants stratified into normotensive and hypertensive individuals, by sex. No significant differences were found for almost all variables except, clearly, for SBP and DBP. In addition, normotensive men had higher means related to BMI in relation to hypertensive individuals, whose, in contrast, showed higher values for RHR.

**Table I - Anthropometric and hemodynamic characteristics**

| Variables | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Normotensive (n=31) | Hypertensive (n=11) | p | Normotensive (n=84) | Hypertensive (n=21) | p |
| Age (years) | 38.87±10.49 | 41.64±10.35 | 0.457 | 44.57±9.98 | 39.81±15.47 | 0.400 |
| Weight (kg) | 87.87±14.36 | 79.16±12.07 | 0.080 | 68.35±12.11 | 64.78±10.74 | 0.221 |
| Height (m) | 1.74±0.70 | 1.74±0.08 | 0.816 | 1.60±0.061 | 1.61±0.79 | 0.421 |
| SBP (mmHg) | 120.39±10.48 | 150±8.56 | 0.000* | 119.81±12.71 | 156.95±19.51 | 0.000* |
| DBP (mmHg) | 76.32±7.14 | 95.45±6.47 | 0.000* | 73.69±12.70 | 92.52±11.13 | 0.000* |
| Abdomen (cm) | 99.14±12.24 | 94.14±10.38 | 0.234 | 89.46±10.60 | 85.09±8.17 | 0.113 |
| WC (cm) | 95.69±12.15 | 88.64±10.74 | 0.97 | 81.85±9.88 | 79.33±8.75 | 0.288 |
| HC (cm) | 105.74±6.68 | 102.41±6.73 | 0.164 | 104.30±9.58 | 102.50±7.98 | 0.430 |
| WHR | 0.90±0.83 | 0.86±0.86 | 0.205 | 0.78±0.65 | 0.77±0.70 | 0.526 |
| BMI (kg/m²) | 29.14±4.83 | 25.97±3.06 | 0.049* | 26.75±5.17 | 24.85±3.84 | 0.168 |
| RHR (bpm) | 75.26±9.73 | 83.64±7.99 | 0.014* | 73.86±11.14 | 74.33±9.89 | 0.849 |

Source: Authors (2020); *$p \leq 0.05$

Table II shows the correlation analyzes between anthropometric and hemodynamic variables. It was noted that despite the relationship among anthropometric variables, no association was found among anthropometry, SBP, DBP and RHR.

**Table II - Bivariate correlation of anthropometric and hemodynamic variables of hypertensive workers.**

| Variables | Age | Weight | Height | BMI | AB | WC | HC | SBP | DBP | RHR | WHR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | -- | .318 | -.035 | .415* | .640** | .575** | .262 | .031 | .138 | .196 | .554** |
| Weight | | -- | .622** | .830** | .754** | .790** | .738** | .043 | .054 | .274 | .421* |
| Height | | | -- | .131 | .398* | .386* | .187 | -.113 | -.070 | .236 | .293 |
| BMI | | | | -- | .693** | .740** | .822** | .197 | .183 | .221 | .326 |
| Abdomen | | | | | -- | .936** | .497** | .136 | .268 | .331 | .757** |
| WC | | | | | | -- | .523** | .192 | .284 | .348 | .807** |
| HC | | | | | | | -- | .058 | .035 | .133 | -.023 |
| SBP | | | | | | | | -- | .502** | .056 | .171 |
| DBP | | | | | | | | | -- | .354* | .234 |
| RHR | | | | | | | | | | -- | .303 |
| WHR | | | | | | | | | | | -- |

Source: Authors (2020).Note: *p≤0.05; **p≤0.01.

## Discussion

In the present study, although strong correlations were found among anthropometric variables, there was no relationship among anthropometric and hemodynamic variables (i.e., SBP, DBP and RHR). However, other findings showed a higher prevalence of overweight in normotensive men compared to the hypertensive group, which presented higher levels of RHR.

Overweight and obesity are classified as serious public health issues of multifactorial origin, characterized by excessive accumulation of body fat, which has shown increased prevalence at international levels [20]. The unwanted increase in adipose tissue is often due to hypokinesia and high caloric intake, consequently resulting in negative health outcomes, such as increased risk of chronic degenerative diseases [22].

Nutritional status in this investigation was verified by the BMI. Lower values of overweight were identified in the hypertensive group; however, it is plausibly highlighted that the accumulation of adipose tissue over time is related to the risks of hypertension in men and women, as reported in clinical trials that analyzed individuals from different work sectors [14-16].

Regarding RHR, hypertensive men showed higher rates at rest. In this context, a prospective study analyzed and described gender differences among other hemodynamic reference variables such as SBP and DBP, and observed the occurrence of higher values for males compared to the opposite sex [18]. It then indicates that adequate management, new formulations and more effective strategies must be implemented in this population when addressing these issues, especially regarding sex differences.

Another study, however, with a sample involving 290 hypertensive patients (62.1% women), found that hypertensive women had greater control of these disorders compared to men, despite the existence of negative biopsychosocial variables that could influence treatment adherence [23].

Blood pressure indicators are essential for the prevention and monitoring of future cardiovascular events. The tracking of these variables obtained

through basic and applied research, results in the development of public health strategies for primary and secondary preventions in combating the harmful effects on health status [24].

In this study, strong correlations were found between anthropometric indicators (r=0.738 - for weight and hips; and r=0.936 - for abdomen and waist circumference), but it was not possible to observe these associations with the outcome variables (SBP and DBP), a possible explanation was the low sample size that did not allow to verify inferences.

The workplace is a susceptible scenario for interventions to reduce and interrupt sedentary behaviors aiming to improving cardiometabolic health and, consequently, the quality of life of these individuals [15,16].

## Conclusion

There is great importance in monitoring and screening anthropometric and cardiovascular parameters in the national scenario. In particular, of studies with epidemiological samples that better represent cultural conditions of workers involved in different functions of organs of the executive branch.

To date, no study was conducted in the workplace with public servants in the State of Sergipe involving variables such as overweight/obesity obtained through different anthropometric measurements in cardiovascular health, thus reflecting on possible quality of life parameters.

Encouraging people to be physically active with implementations of physical activity programs in the workplace are pertinent approaches to deal with poor health habits. Especially in view of the associated risks between obesity, cardiovascular health and mortality. It is recommended the practice of physical activities at opportune times, within working routines and to encourage practices also outside of it, aiming to improve anthropometric indicators

## References

1. Casonatto J, Goessler KF, Cornelissen VA, Cardoso JR, Polito MD. The blood pressure--lowering effect of a single bout of resistance exercise: A systematic review and meta-analysis of randomised controlled trials. Eur J Prev Cardiol 2016;23(16):1700-14. https://doi.org/10.1177/2047487316664147

2. Pedralli ML, Waclawovsky G, Camacho A, Markoski MM, Castro I, Lehnen AM. Study of endothelial function response to exercise training in hypertensive individuals (SEFRET): study protocol for a randomized controlled trial. Trials 2016;17(1):84. https://doi.org/10.1186/s13063-016-1210-y

3. Abdelaal AA, Mohamad MA. Obesity indices and hemodynamic response to exercise in obese diabetic hypertensive patients: Randomized controlled trial. Obes Res Clin Pract 2015;9(5):475-86. https://doi.org/10.1016/j.orcp.2014.11.001

4. Bonsu B, Terblanche E. The training and detraining effect of high-intensity interval training on post-exercise hypotension in young overweight/obese women. Eur J Appl Physiol 2015;116(1):77-84. https://doi.org/10.1007/s00421-015-3224-7

5. Santos ES, Asano RY, Filho IG, Lopes NL, Panelli P, Nascimento DC, et al. Acute and chronic cardiovascular response to 16 weeks of combined eccentric or traditional resistance and aerobic training in elderly hypertensive women. J Strength Cond Res 2014;28(11)3073-84. https://doi.org/10.1519/JSC.0000000000000537

6. Banegas JR, Ruilope LM, de la Sierra A, Vinyoles E, Gorostidi M, de la Cruz JJ et al. Rela-

tionship between clinic and ambulatory blood-pressure measurements and mortality. N Engl J Med 2018;378(16):1509-20. https://doi.org/10.1056/NEJMoa1712231

7.  Wall HK, Ritchey MD, Gillespie C, Omura JD, Jamal A, George MG. Vital signs: prevalence of key cardiovascular disease risk factors for million hearts 2022 — United States, 2011–2016. Morb Mortal Wkly Rep 2018;67(35):983-991. https://doi.org/10.15585/mmwr.mm6735a4

8.  Xu J, Murphy SL, Kochanek KD, Bastian BA. Death: Final Report for 2013. Natl Health Stat Report 2018;67(2):01-76.

9.  Abramowitz MK, Hall CB, Amodu A, Sharma D, Androga L, Hawkins M. Muscle mass, BMI, and mortality among adults in the United States: A population-based cohort study. PLoS ONE 2018;13(4):01-16. https://doi:.org/10.1371/journal.pone.0194697

10. Forno CD, Finger IR. Qualidade de vida no trabalho: conceito, histórico e relevância para a gestão de pessoas. Rev Bras Qual Vida 2015;07(02):103-12.

11. Anjos LA, Esteves TV, Mariz VG, Vasconcellos MTL. Tendência do nível de atividade física ocupacional e estado nutricional de adultos ao longo de quatro décadas no Brasil. Rev Bras Saúde Ocup 2018;43:e5. https://doi.org/10.1590/2317-6369000013516

12. Parry S, Straker L. The contribution of office work to sedentary behaviour associated risk. BMC Public Health 2013;13(296):01-10. https://doi.org/10.1186/1471-2458-13-296

13. Ojo S, Bailey D, Chater A, Hewson D. The impact of active workstations on workplace productivity and performance: a systematic review. Int J Environ Res Public Health 2018;15(3):e417. https://doi.org/10.3390/ijerph15030417.

14. Browne RAV, Farias-Junior LF, Freire YA, Schwade D, Macêdo GAD, Montenegro VB, et al. Sedentary occupation workers who meet the physical activity recommendations have a reduced risk for metabolic syndrome. Int J Occup Environ Med 2017;59(11):1029-33. https://doi.org/10.1097/JOM.0000000000001104

15. Rodriguez-Reyes RR, Navarro-Zarza JE, Tello-Divicino TL, Parra-Rojas I, Zaragoza-García O, Guzmán-Guzmán IP. Detection of cardiovascular risk in healthcare workers on the basis of WHO/JNC 7/ATP III criteria. Rev Med Inst Mex Seguro Soc 2017;55(3):300-8.

16. Bernhard JC, Dummel KL, Reuter E, Reckziegel MB, Pohl HH. Cardiovascular risk in rural workers and its relation with body mass index. Arch Endocrinol Metab 2018;62(1):72-78. https://doi.org/10.20945/2359-3997000000011

17. Doran K., Resnick B. Cardiovascular risk factors of long-term care workers. Workplace Health Saf 2017;65(10):467-477. https://doi.org/10.1177/2165079917693018

18. Carvalho CA, Fonseca PCA, Barbosa JB, Machado SP, Silva AAM. Associação entre fatores de risco cardiovascular e indicadores antropométricos de obesidade em universitários de São Luís, Maranhão, Brasil. Cienc Saude Coletiva 2015;20(2):479-90. https://doi:10.1590/1413-81232015202.02342014

19. Cuppari L. Nutrição clínica no adulto: Guias de medicina ambulatorial e hospitalar. UNIFESP- Escola Paulista de Medicina. 2ª ed. Barueri: Manole; 2005.

20. World Health Organization (WHO). Global status report on noncommunicable diseases. 2014.

21. VII Diretriz Brasileira de Hipertensão. Arq Bras Cardiol 2016;107(3Suppl3).

22. Atashak S, Stannard, SR, Azizbeigi K. Cardiovascular risk factors adaptation to concurrent training in overweight sedentary middle-aged men. J Sports Med Phys Fitness 2016;56(5):624-30.

23. Silva SSBE, Oliveira SFSB, Pierin AMG. The control of hypertension in men and women: a comparative analysis. Rev Esc Enferm USP 2016;50(1):50-8. https://doi.org/10.1590/S0080-623420160000100007

24. Gomes MN, Maciel MG, Torres RS, Barbosa SNAA. Relação entre variáveis antropométricas, bioquímicas e hemodinâmicas de pacientes cardiopatas. Int J Cardiovasc Sci 2015;28(5):392-399. https://doi.org/10.5935/2359-4802.20150058