

# Arterial hypertension in women

## Prevalence and waist circumference

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### Abstract

**Objective:** To estimate the prevalence of systemic hypertension in an adult female population and to evaluate its association with waist circumference (WC). **Methods:** This was a cross-sectional study involving women older than 20 years, living in Valparaíso de Goiás (GO, Brazil). All participants completed a questionnaire and had their blood pressure (BP) measured three times, five minutes apart from each other. Systemic hypertension was defined as systolic (SBP) and diastolic blood pressure (DBP),  $\geq 140$  and  $\geq 90$  mm Hg, respectively, and WC was assessed using the cut-off points of  $>88$  and  $>80$  cm. For data analysis, hypertension prevalence rates were calculated. Analysis of variance (ANOVA) was used to examine the relationship between WC and hypertension, and the chi-square test was used to determine the relationship between age group and incidence of hypertension. **Results:** Prevalence of hypertension in women from Valparaíso de Goiás was 25.2% (CI<sub>95%</sub>: 20.3–30.0), with higher prevalence (47%) among those aged over 52 years. There was a significant difference between WC values for hypertensive and normotensive women. Values for WC  $\geq 88$  cm were found in 33 and 59% of the normotensive and hypertensive women, respectively. When the cut-off point of 80 cm was used for WC, the difference between the numbers of hypertensive and normotensive women was even more pronounced (86 and 57%, respectively). **Conclusion:** Prevalence of hypertension in women living in Valparaíso de Goiás was found to be high and strongly associated with WC.

Key words: Hypertension; Prevalence; Waist circumference; Women

### Introduction

Cardiovascular diseases (CVD) are the main cause of morbidity, mortality, and disabilities. In 2003, they were responsible for one-third of all deaths throughout the world and 27.4% of the fatalities in Brazil<sup>1,2</sup>.

Cardiovascular diseases have also a significant economic impact, since they are the second and third disease in men and women, respectively, which contributes most to years of productive life lost<sup>3</sup>. In 2005, they had a cost of more than R\$ 1.3 billion for the Brazilian [government]. They are also the leading cause of death among women, accounting for more deaths than all other causes combined.

The estimated prevalence of hypertension has a great

variation throughout countries or even regions of the same country. This variability may reflect differences between populations, measurement techniques, observers, and age of the population studied<sup>5</sup>.

In Brazil, prevalence of arterial hypertension (defined as a blood pressure  $>140/90$  mm Hg) ranges from 22.3 to 43.9%<sup>6-8</sup>. However, there are few studies of hypertension in Brazilian women, with frequencies ranging from 11.6 to 33%<sup>9-11</sup>.

In São Paulo, a study conducted in women aged 20 to 49 years showed that hypertension was associated with 53.1% of deaths<sup>9</sup>.

Several studies suggest association between arterial

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hypertension (AH) and anthropometric indicators reflecting the presence of excess adipose tissue; especially, waist circumference (WC)<sup>12,13</sup> shows a high correlation with visceral fat. In another study conducted in São Paulo, body mass index (BMI) and WC were found to be significantly associated with AH among both men and women<sup>14</sup>.

The purpose of the present study was twofold: to evaluate the prevalence of systemic hypertension in women living in Valparaíso de Goiás (GO, Brazil) and to determine its association with WC.

## Methods

This is an epidemiological, observational, descriptive, and cross-sectional study of a random sample of the urban population in the municipality of Valparaíso de Goiás (GO, Brazil) in women above the age of 20.

Data were collected in a household survey using a questionnaire. The minimum sample size was calculated by estimating prevalence as 23%. A 5%-margin of error was accepted, and the level of significance was set at 5% ( $p < 0.05$ ).

Data were collected according to the methodology previously described<sup>15</sup>. Thus, 273 women were the minimum sample size for 60-thousand female adult inhabitants. This segment of population was chosen through a sampling procedure, using the IBGE census tract. From this, the total number of households to be visited and those to be visited within each census tract were calculated. For each tract, blocks were numbered and one of them was drawn at random, letters were written to define where visitation should begin. Visits were conducted on the basis of the corner drawing; the interviewers moved in a clockwise direction and the closest homes were visited first.

Measurements of blood pressure (BP) and WC were performed by three students of the medical school, who received theoretical and practical training and carried out the home visits. In these homes, the female resident, aged 20 or above, whose birthday was closest to the date of the visit, was interviewed and included in the study sample. After a five-minute rest, BP was measured three times at five-minute intervals. For analysis purposes, only the third measurement was used. WC was measured midway between the lowest ribs and the iliac crest, using a non-stretchable measuring tape. WC  $> 88$  and 80 cm were used as cut-off points.

Blood pressure readings were taken according to the following standard procedures: the interviewee had to be at relative rest, after having refrained from smoking and drinking alcohol or coffee for at least 30 min. Measurements were taken on the subjects' bare right arm, which

was resting on a flat surface; the cuff was placed as to leave the antecubital fossa free so that the brachial artery could be palpated.

Women were considered hypertensive if their systolic (SBP) and diastolic blood pressure (DBP) were  $\geq 140$  and 90 mm Hg, respectively. Those who had already been diagnosed and treated, and whose hypertension was under control, were included as hypertensive.

The project was submitted to and approved by the Research Ethics Committee of the Catholic University of Brasilia (DF, Brazil), and all participants signed an informed Consent Form.

The sample included 310 women who filled out the questionnaire and had three BP readings and one WC measurement taken at their homes. For data analysis, hypertension prevalence rates were calculated.

Analysis of variance (ANOVA) was used to assess the relationship between WC and hypertension, and the chi-square test was used to assess the relationship between age group and hypertension.

## Results

Three hundred and ten women, with ages ranging from 20 to 84 years, were included in the present study. The mean age of the sample was 41.5 (median 38.9) years, with a standard deviation (SD) of 14.9 years.

Prevalence of hypertension among women in Valparaíso de Goiás (GO, Brazil) was estimated to be 25.2% ( $CI_{95\%}$ : 20.3–30.0).

Prevalence of hypertension according to age groups is shown in Table 1. There was a statistically significant higher incidence of hypertension among older women ( $p < 0.001$ ). Prevalence of hypertension among women increased proportionally to their age. In women above the age of 40, and especially among those over 52 years of age, the percent rates were fairly high, 33 and 47%, respectively. Data from these women are consistent with those from the literature for the population as a whole, i.e., prevalence of AH increases with increasing age.

Table 2 shows the distribution of WC in normotensive and hypertensive women. Regarding WC, there was a significant difference between normotensive and hypertensive women. WC  $\geq 88$  cm were observed in 33 and 59% of the normotensive and hypertensive women, respectively. When a cut-off value of 80 cm was used, a greater difference was observed between normotensive and hypertensive women, 57 and 86%, respectively.

Table 3 shows the distribution of waist circumference (WC) in Brazilian hypertensive and non-hypertensive women from Valparaíso de Goiás (GO, Brazil)

**Table 1. Distribution of hypertension by age group in Brazilian women from Valparaíso de Goiás (GO, Brazil).**

Hypertension	Age groups n (%)				Total (N=310)
	≤29 y. (N=76)	29-39 y. (N=82)	39-52 y. (N=76)	>52 y. (N=76)	
No	72 (95)	69 (84)	51 (67)	40 (53)	232 (75)
Yes	4 (5)	13 (16)	25 (33)	36 (47)	78 (25)

y=years.

**Table 2. Distribution of waist circumference (WC) and Hypertension in Brazilian hypertensive and non-hypertensive women from Valparaíso de Goiás (GO, Brazil).**

WC (cm)	Hypertension n (%)		Total (N=302)
	No (N=226)	Yes (N=76)	
<88	152 (67)	31 (41)	183 (61)
≥88	74 (33)	45 (59)	119 (39)

**Table 3. Distribution of waist circumference (WC) in Brazilian hypertensive and non-hypertensive women from Valparaíso de Goiás (GO, Brazil).**

WC (cm)	Hypertension n (%)		Total (N=302)
	No (N=226)	Yes (N=76)	
≤80	98 (43)	11 (14)	109 (36)
>80	128 (57)	65 (86)	193 (64)

## Discussion

Since the 1970s, when the first studies on prevalence of hypertension in Brazil were published, the literature has been growing; however, domestic data on prevalence of hypertension are still not available.

According to the 5<sup>th</sup> Brazilian Hypertension Guidelines (2006), and with a cut-off value of 140/90 mm Hg, prevalence of hypertension in the adult Brazilian population varies from 22.3 to 44.0%<sup>2,6-8</sup>. Few studies with varying results have examined the prevalence of hypertension in women.

Among the risk factors for mortality, hypertension accounts for approximately 40 and 25% of the deaths from cerebrovascular disease and coronary artery disease (CAD), respectively.

Although mortality due to CAD in women is higher than in men, incidence of myocardial infarction (MI) in women is lower. However, it is known that this incidence rises sharply with menopause<sup>16</sup>.

Hypertension is a cardiovascular risk factor for both men and women. It can also lead to cerebrovascular complications, poor blood flow to the extremities, heart failure, and chronic kidney disease. According to DATASUS (Brazilian Ministry of Health), CVD accounted for 31% of the deaths in Brazil (2003), and cerebrovascular disease affected more women than men.

Other authors have also demonstrated that prevalence of hypertension increases with age. In American women over the age of 70, prevalence of hypertension is as high as 70 to 80%, and among black women similar rates are observed from the age of 60 on<sup>17</sup>.

Hypertension has been shown to be a strong predictor of cardiovascular disease even for pre-menopausal wom-

en, in which incidence of hypertension causes a tenfold increase in mortality from CAD<sup>17</sup>.

In a study, 6,859 normotensive men and women were divided into three categories: optimal, normal, and borderline BP (≤120/≤80, 121–129/81–84, and 130–139/85–89 mm Hg, respectively). Borderline BP was associated with a hazard ratio for CVD of 1.6 in men and 2.5 in women [as] compared with optimal BP<sup>18</sup>. Thus, even at levels considered normal, incidence of cardiovascular events increases with higher impact on women.

There is a close relationship between obesity, especially central obesity, and prevalence of hypertension. The NHANES (1999–2000) results show an increase in prevalence of hypertension, which was attributed to a rise in obesity<sup>19</sup>. It is known that the impact of body weight on prevalence of hypertension differently affects men and women according to the age group. When the population was divided into quartiles according to BMI, hypertension prevalence in women aged 55 to 64 (who were in the upper BMI quartile) was found to be higher than in men of the same age group.

In the present study, BMI was not analyzed. However, we found that hypertension prevalence was higher in the group with the highest WC. In those with WC ≥88 cm, 59% were hypertensive and 33% were not. Using 80 cm as a cut-off value, a greater difference between those with and without hypertension (86 and 57%, respectively) was found.

In conclusion, our study shows that hypertension rates found in Brazilian women are similar to those in other studies<sup>9-11</sup>, with high prevalence and significant association with WC. Hypertension remains one of the most rel-

evant morbidity factors in adults, being directly or indirectly related to the main cause of death in Brazil. Therefore, it is important that new studies broaden our epidemiological knowledge of hypertension in Brazil, thus enabling the development of more effective intervention programs.

## References

1. Avoiding Heart Attacks and Strokes: Don't be a victim, protect yourself. The World Health Organization, 2005. Available from: [http://www.who.int/entity/cardiovascular\\_diseases/resources/avoid\\_heart\\_attack\\_report/en/index.html](http://www.who.int/entity/cardiovascular_diseases/resources/avoid_heart_attack_report/en/index.html)
2. V Diretriz Brasileira de Hipertensão. São Paulo: Sociedade Brasileira de Cardiologia; 2006. Available from: <http://publicacoes.cardiol.br//consenso>
3. The Atlas of Heart Disease and Stroke. The World Health Organization, 2004. Available from: [http://www.who.int/cardiovascular\\_diseases/en/cvd\\_atlas\\_05\\_HBP.pdf](http://www.who.int/cardiovascular_diseases/en/cvd_atlas_05_HBP.pdf)
4. Mosca L, Banka CL, Benjamin EJ, Berra K, Bushnell C, Dolor RJ, et al. Evidence-based guidelines to cardiovascular disease prevention in women: 2007 Update. *Circulation*. 2007 Mar;115(11):1148-1501.
5. Klein CH, Silva NAS, Nogueira AR, Block KV, Campos LHS. Hipertensão arterial na Ilha do Governador, Brasil. II. Prevalência. *Cad Saúde Pública*. 1995;11(3):389-394.
6. IV Diretriz Brasileira de Hipertensão Arterial. *Arq Bras Cardiol*. 2004 Mar;82(supl 4):7-22.
7. Gus I, Harzheim E, Zaslavsky C, Medina C, Gus M. Prevalence, awareness, and control of systemic arterial hypertension in the State of Rio Grande do Sul. *Arq Bras Cardiol*. 2004 Nov;83(5):429-433.
8. Matos AC, Ladeia AM. Assessment of cardiovascular risk factors in a rural community in the Brazilian State of Bahia. *Arq Bras Cardiol*. 2003 Sep;81(3):297-302.
9. Chiavegatto Filho ADP, Laurenti R, Gottlieb SLD, Jorge MHPM. Mortalidade por doença hipertensiva em mulheres de 20 a 49 anos no Município de São Paulo, SP, Brasil. *Rev Bras Epidemiol*. 2004;7:252-258.
10. de Souza AR, Costa A, Nakamura D, Mocheti LN, Stevanato Filho PR, Ovando LA. Um estudo sobre hipertensão arterial sistêmica na cidade de Campo Grande, MS. *Arq Bras Cardiol*. 2007 Apr;88(4):388-392.
11. Teodósio MR, Freitas CLC, Santos NRV, Oliveira ECM. Hipertensão na mulher: estudo em mães de escolares de Jaboatão dos Guararapes - Pernambuco - Brasil. *Rev Assoc Med Bras*. 2004;50(2):158-162.
12. Grievink L, Alberts JF, O'Neil J, Gerstenbluth I. Waist Circumference as a measurement of obesity in the Netherlands Antilles; association with hypertension and diabetes mellitus. *Eur J Clin Nutr*. 2004 Aug;58(8):1159-1165.
13. Snijder MB, Zimmet PZ, Visser M, Dekker JM, Seidell JC, Shaw JE. Independent and opposite associations of waist and hip circumferences with diabetes, hypertension and dyslipidemia: the AusDiab Study. *Int J Obes Relat Metab Disord*. 2004 Mar;28(3):402-409.
14. Sarno F, Monteiro CA. Importância relativa do índice de massa corporal e a circunferência abdominal na predição da hipertensão arterial. *Rev Saúde Pública*. 2007 May;41(5):788-796.
15. Oliveira RZ, Nogueira JL. Hipertensão arterial no município de Cianorte, estado do Paraná, Brasil. *Acta Scientiarum Health Sciences*. 2003;25(1):75-79.
16. Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: a 26 year follow-up of the Framingham population. *Am Heart J*. 1986 Feb;111(2):383-90.
17. Burt VL, Whelton P, Rocella EJ, Brown C, Cutler JA, Higgins M, et al. Prevalence of hypertension in the US adult population. Results from the Third National Health and Nutrition Examination Survey, 1988-1991. *Hypertension*. 1995 Mar;25:305-13.
18. Vasan RS, Larson MG, Leip EP, Evans JC, O'Donnell CJ, Kannel WB, et al. Impact of high-normal blood pressure on the risk of cardiovascular disease. *N Engl J Med*. 2001 Nov;345:1291-7.
19. Fields LE, Burt VL, Cutler JA, Hughes J, Rocella EJ, Sorlie P. The burden of adult hypertension in the United States 1999 to 2000: a rising tide. *Hypertension*. 2004 Oct;44(4):398-404.
20. MacMahon SW, Blacket RB, Macdonald GJ, Hall W. Obesity, alcohol consumption and blood pressure in Australian men and women the National Heart Foundation of Australia Risk Factor prevalence Study. *J Hypertension*. 1984 Feb;2(1):85-91.