# Prevalence of prehypertension and associated factors in women

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**Prevalence of prehypertension and associated factors in women**

**Objective.** To estimate the prevalence of factors associated with prehypertension among 20 to 59 years old women cared for by primary healthcare units that adopted the Family Health Strategy. **Method**. Cross-sectional study conducted in a city in the interior of Minas Gerais, Brazil. The study's population was composed of 1 773 women with blood pressure below 140/90 mm Hg. The dependent variable was prehypertension (≥120/80 mmHg to <140/90 mmHg). **Results.** The prevalence of prehypertension was 20.6%. The multivariate analysis showed that overweight or obese women of African descent, 40 years old or older with a family history of hypertension, had an increased risk of presenting prehypertension. **Conclusion.** Although the prevalence found in this study is lower than that reported by other studies, nurses need to implement efforts to prevent and detect prehypertension, especially among high-risk groups.

**Key words:** epidemiology; cross-sectional studies; prehypertension; women.

**Prevalencia y factores asociados prehipertensión arterial en mujeres**

**Objetivo.** Estimar la prevalencia de factores asociados a prehipertensión en mujeres de 20 a 59 años, adscritas a dos unidades básicas de salud que adoptaron la Estrategia de Salud Familiar. **Metodología.** Estudio de corte transversal realizado un municipio del interior de Minas Gerais, Brasil. La población consistió en 1 773 mujeres con presión arterial menor de 140/90 mm Hg. La variable dependiente fue la prehipertensión arterial (≥120/80 mmHg a <140/90 mmHg). **Resultados.** La prevalencia de prehipertensión fue de 20.6%. El análisis multivariado mostró que las mujeres de 40 y más años, con piel negra o parda, con sobrepeso u obesidad y aquellas con historia familiar de hipertensión, tenían un mayor riesgo de prehipertensión. **Conclusión.** Aunque la prevalencia encontrada en esta investigación es menor a la reportada por otros estudios,

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**Article linked to research:** Avaliação de estratégias para o rastreamento do câncer do colo do útero em mulheres cobertas pela Estratégia de Saúde da Família no município de Juiz de Fora, Minas Gerais.

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es necesario que las enfermeras fortalezcan los esfuerzos en la prevención y detección de la prehipertensión, especialmente en los grupos de mayor riesgo.

**Palabras clave:** epidemiología; estudios transversales; prehipertensión; mujeres.

**Prevalência e fatores associados pré-hipertensão arterial nas mulheres**

**Objetivo**. Estimar a prevalência de fatores associados a pré-hipertensão em mulheres de 20 a 59 anos, vinculadas a duas unidades básicas de saúde que adotaram a Estratégia de Saúde Familiar. **Metodologia**. Estudo de corte transversal realizado no município do interior de Minas Gerais, Brasil. A população consistiu em 1 773 mulheres com pressão arterial menor de 140/90 mm Hg. A variável dependente foi a pré-hipertensão arterial (≥120/80 mmHg a <140/90 mmHg). **Resultados**. A prevalência de pré-hipertensão foi de 20.6%. A análise multivariado mostrou que tinham um maior risco de pré-hipertensão as mulheres de 40 e mais anos, com pele negra ou parda, com sobrepeso ou obesidade e aquelas com história familiar de hipertensão. **Conclusão**. Ainda que a prevalência encontrada nesta investigação é menor à reportada por outros estudos, é necessário que as enfermeiras fortaleçam os esforços na prevenção e detecção da pré-hipertensão, especialmente nos grupos de maior risco.

**Palavras-chave:** epidemiologia; estudos transversais; pré-hipertensão; mulheres.

## Introduction

The variable blood pressure (BP) has a normal distribution in the population and its elevation is associated with cardiovascular diseases. There is no threshold limit value distinguishing hypertensive individuals who will experience a cardiovascular event from those who will not. The risk of a cardiovascular disease depends on blood pressure and coexistent factors.[1] According to Magrini and Martini,[2] BP may be classified borderline when systolic blood pressure (SBP) values are between 130-139 mmHg, and diastolic blood pressure (DBP) values are between 85-89 mmHg, while normal SBP is below 130 mmHg and normal DBP is below 85 mmHg. BP is classified as optimal when SBP is below 120 mmHg and DBP is below 80 mmHg. From this perspective, the Pan-American Health Organization (PAHO) and the World Health Organization (WHO) support strategies that reduce the impact caused by altered BP through its control and prevention.

The term prehypertension was developed in 2003 by the American Guidelines on Hypertension[3] to warn of the elevation of blood pressure and the risk of hypertension and cardiovascular diseases. Individuals with SBP between 120 and 139 mmHg and/or DPB 80 and 89 mmHg are considered prehypertensive. The Brazilian Society of Cardiology adopts the same diagnosis for prehypertension in its 1st Brazilian Position Paper on Prehypertension, White Coat Hypertension and Masked Hypertension, and highlights the importance of valuing and intervening in this condition as an opportunity to prevent hypertension and, consequently, reduce the risk of cardiovascular diseases in individuals presenting such a condition.[4] Prehypertension is therefore considered an intermediate stage of hypertension.[5,6]

The prevalence of prehypertension, risk factors and the incidence of cardiovascular events were determined in a cohort of 60,785 Australian postmenopausal women monitored for 7.7 years. Prehypertension was identified in 39%, of women who were 58% more likely to die from a cardiovascular event, with a 76% increase in the

risk of a myocardial infarction, 93% increased risk for stroke, 36% increased risk of hospitalization for heart failure, and a 66% increase in the risk for any other cardiovascular event.[7] The incidence of hypertension increases with age up to the 5th decade of life, particularly among individuals with normal blood pressure at its highest level. Four in each five individuals aged between 40 and 49 years old with prehypertension developed hypertension within ten years.[7] This study's aim was to estimate the prevalence of prehypertension and associated factors in women covered by two healthcare units (Family Health Strategy) in a city in Zona da Mata, MG, Brazil. Nurses should know the profile of users of primary healthcare services to encourage the control of BP and the prevention of hypertension.

## Methodology

This is a cross-sectional study in which participants were recruited at their homes and data were collected in two primary health units in a medium-sized city in the Southeast of Minas Gerais, Brazil. This study is part of the research project "Assessing strategies to screen cervical cancer in women cared for by the Family Health Strategy in Juiz de Fora, MG" in a partnership among the Social Medicine Institute at the State University of Rio de Janeiro, the University of São Paulo, and the *Núcleo de Assessoria e Estudos em Saúde* at the Federal University of Juiz de Fora. In order to ensure compliance in ethical issues, this study was approved by the Institutional Review Board at the State University of Rio de Janeiro (UERJ) in agreement with protocol No. 0026.1.259.180-09.

Data were collected between October 2010 and August 2012. A total of 2 077 women aged between 20 and 59 years old living in the areas covered by the healthcare units were approached. Of these, 1 773 women whose blood pressure was below 140/90 mmHg were included in this study; those considered hypertensive were excluded (28.7%). A structured questionnaire was used to collect data. It was based on the adaptation of the National Health Survey questionnaire used in 2013 by IBGE and the Ministry of Health after its coordinators authorized its use. This questionnaire was applied by professionals with a bachelor degree who were previously trained. After the interviews, the measures of blood pressure, weight, height, and waist circumference were taken and then a gynecological exam and Pap smear were performed.

Blood pressure was taken using two independent measures with an interval of one minute. The participant remained seated with the forearm near the level of heart. The procedure was performed in accordance with nursing norms and techniques used to measure vital signs[8] meeting the recommendations provided by the Brazilian Guidelines on Hypertension VI.[9] The equipment was calibrated in accordance with the healthcare unit's technical maintenance prescriptions.

For anthropometric assessment, weight was taken using a Tanita brand electronic scale with precision to 0.1g and height was measured using Altura Exata brand stadiometer with precision to 0.1cm. Waist circumference was measured with the women standing upright with inelastic metric tape placed through the umbilicus involving the entire abdominal circumference, at the end of a normal expiration, with the evaluator standing in front of the woman.

Data collection was performed individually in a private room by nurses before a gynecological exam. After the interview, the data collection instrument was examined and reviewed by field supervisors to ensure quality control. The questionnaires were secured until they were sent for transcription. Data were stored in a database developed with Epi Info (version 6.04b). The dichotomous dependent variable was the presence of prehypertension, that is, Systolic Blood Pressure (SBP) between 120-139 mmHg or Diastolic Blood Pressure (DBP) between 80-89 mmHg.[4,10] The independent variables were grouped into socio-demographic variables (age, self-reported race, marital status, schooling, social support); lifestyle (consumption of alcohol, smoking, and regular physical activity); health status (self-reported health status, time since last BP measurement, family history of hypertension); and measurements (BMI, waist circumference).

The anthropometric data were assessed using Body Mass Index (BMI) obtained by the division of body weight (measured in kilograms) by height (measured in meters). Women with BMI equal to or greater than 25 kg/m$^2$ or waist circumferences equal to or greater than 88cm were considered overweight.[11] The analysis followed the following steps: univariate analysis to describe the distribution of dependent and independent variables in the studied population; bivariate analysis to identify association of each of the independent variables with the outcome associated with the dependent dichotomous variable. The variables that presented p values < 0.20 in the bivariate analysis were selected for multivariate analysis. The following variables were included in the final model: age, race, family history of hypertension, BMI, and abdominal circumference. The analysis was performed in Stata 11.0.

## Results

A prevalence of 20.6% for pre-hypertension was found among the 1 773 participants. Of these, 85% had completed high school; 53% were employed; 52% reported being of African descent or biracial; 88% have the support of friends or family; and 40% considered their health status to be good or very good. Self-reported consumption of alcohol in the last 30 days was common to 57% of the women. When they were asked whether they had taken four or more alcoholic drinks on a single occasion, 22% of the women answered yes. In regard to history of and care for health, 77% reported no exercise and 21% reported smoking, as shown in the Table 1.

A total of 61% reported having their blood pressure measured less than six months prior; 80% reported a positive family history of hypertension; and 71% of the interviewees used contraceptives. In regard to body weight and waist circumference, 58% and 57% respectively were above normal parameters (Table 1). The bivariate analysis (Table 2) revealed prehypertension is associated with age, race, positive family history for hypertension, body mass index, and waist circumference. The prevalence of prehypertension increased with age, with prevalence rates of 2.1 among women aged from 30 to 39, of 4.0 for women between the ages of 40 and 49 years old, and of 4.7 in women from 50 to 59 years old when compared to younger women (Table 2).

As already described, we selected for the multivariate analysis the variables that presented p value=0.20 in the bivariate analysis. The following variables were considered in the final model: age, race, family history of hypertension, BMI, and waist circumference (Table 3).

## Discussion

The prevalence of hypertension of 20.6% among the studied women was below the 35.6% found by Nery *et al.*[12] among adults living in Niteroi, RJ, Brazil, the 39.8% in Hungarian workers,[13] and the 33.6% found among Chinese individuals by Meng *et al.*[14] This study is in accordance with Yadav *et al.*[15] in regard to significant increase of prehypertension from the ages 30 to 39 years old found in a study conducted with the Indian population. According to a study conducted in Florianopolis, SC, Brazil by Silva *et al.,*[16] women aged 50 to 59 years old were 79% more likely to present prehypertension in comparison to 20 to 29 years old women. According to Pearson,[17] changes in BP begin in midlife and tend to decrease after the age of 70.

In regard to race, women who reported being of African descent were 20% more likely to present the condition in comparison to those who reported being from another race. This prevalence is lower that that found by Glasser *et al*.[6] among American women: the prevalence of hypertension was 62.9% among African-Americans and 54.1% among Caucasians. Isesuo[18] found a high prevalence (58.8%) of prehypertension among Nigerian women. Silva *et al*[16] report an association between African descent and prehypertension, which according to the authors, may reflect, in addition to genetic characteristics, discrepant social conditions between those of African descent and Caucasians. Individuals with positive family history of hypertension are more vulnerable to prehypertension.[19,20]

**Table 1.** Demographic and socioeconomic characteristics of the 1,773 women, aged from 20 to 59 years old cared for by the FHS of a city in Zona da Mata, MG, Brazil between October 2010 and August 2012

| Variables | Total* | |
|---|---|---|
| | n | % |
| Total | 1,773 | 100.0 |
| Age (years) | | |
| 20-29 | 522 | 29.4 |
| 30-39 | 530 | 29.9 |
| 40-49 | 425 | 23.9 |
| 50-59 | 296 | 16.69 |
| Schooling (years) | | |
| Up to incomplete primary school | 248 | 14.1 |
| Complete primary school /High school | 1 510 | 85.9 |
| Race | | |
| Other | 848 | 47.8 |
| African-Brazilian + biracial | 925 | 52.2 |
| Support from friends + family | | |
| No support | 221 | 12.0 |
| Received support | 1 553 | 88.0 |
| Self-reported health status | | |
| Very good and good | 709 | 40.1 |
| Regular, poor and very poor | 1 058 | 59.8 |
| Alcohol consumption | | |
| Yes | 1 015 | 57.3 |
| No | 757 | 42.7 |
| Four alcoholic drinks in a single occasion | | |
| No | 381 | 21.5 |
| Yes | 1 391 | 78.5 |
| Regular physical activity | | |
| Yes | 413 | 23.3 |
| No | 1 358 | 76.7 |
| Smoking | | |
| No | 1 394 | 79.2 |
| Yes | 366 | 20.8 |
| Last time BP was measured | | |
| More than 6 months ago | 688 | 38.9 |
| Less than 6 months ago | 1 080 | 61.1 |
| Family history of altered BP | | |
| Yes | 1 420 | 80.5 |
| No | 343 | 19.5 |
| BMI | | |
| Normal | 744 | 42.1 |
| Overweight | 1023 | 57.9 |
| Waist circumference | | |
| Normal | 759 | 43.3 |
| Obesity | 994 | 56.7 |

*The total (n) of each variable may differ due to missing data

**Table 2.** Associated factors and prevalence of prehypertension in 1,773 women without hypertension cared for by the FHS unit in a town of Zona da Mata, MG, Brazil from October 2010 to August 2012

| Variables | Total* | Prehypertension | | Raw PR | CI 95% | *P* |
|---|---|---|---|---|---|---|
| | N | n | % | | | |
| Age (years) | | | | | | |
| 20-29 | 522 | 40 | 7.7 | 1.0 | | |
| 30-39 | 530 | 87 | 16.2 | 2.1 | 1.4-3.1 | <0.001 |
| 40-49 | 425 | 132 | 31.0 | 4.0 | 2.8-5.7 | <0.001 |
| 50-59 | 296 | 107 | 36.1 | 4.7 | 3.2-6.7 | <0.001 |
| Schooling (years) | | | | | | |
| Up to incomplete primary school | 248 | 72 | 29.8 | 1.0 | | |
| Complete primary school High school | 1510 | 291 | 19.2 | 0.6 | 0.5-0.8 | 0.002 |
| Race | | | | | | |
| Other | 848 | 153 | 18.0 | 1.0 | | |
| African-Brazilian + biracial | 925 | 213 | 22.0 | 1.20 | 1.0-1.5 | |
| Support friends + family | | | | | | |
| No support | 221 | 59 | 27.8 | 1.0 | | 0.013 |
| Received support | 1553 | 304 | 19.6 | 0.7 | 0.5-0.9 | |
| Support from religion | | | | | | |
| No | 172 | 35 | 20.4 | 1.0 | | 0.936 |
| Yes | 1594 | 329 | 20.6 | 1.0 | 0.7-1.4 | |
| Self-reported health status | | | | | | |
| Very good and good | 709 | 185 | 26.0 | 1.0 | | <0.001 |
| Regular, poor and very poor | 1058 | 179 | 16.0 | 0.9 | 0.5-0.7 | |
| Consumption of alcohol | | | | | | |
| Yes | 1015 | 233 | 22.9 | 1.0 | | 0.014 |
| No | 757 | 133 | 17.5 | 0.7 | 0.6—0.9 | |
| Last time BP was measured | | | | | | |
| More than 6 months | 688 | 115 | 16.7 | 1.0 | | 0.004 |
| Less than 6 months | 1080 | 250 | 23.5 | 1.3 | 1.1-1.7 | |
| Family history of altered BP | | | | | | |
| No | 343 | 40 | 11.6 | 1.0 | | 0.012 |
| Yes | 1420 | 326 | 22.9 | 1.9 | 1.4-2.7 | |
| BMI | | | | | | |
| Normal | 744 | 78 | 10.4 | 1.0 | | <0.001 |
| Overweight | 1023 | 285 | 27.8 | 2.6 | 2.0-3.4 | |
| Waist circumference Abdominal | | | | | | |
| Normal | 759 | 76 | 10.0 | 1.0 | | <0.001 |
| Obesity | 994 | 282 | 28.3 | 2.8 | 2.1-3.6 | |

*The total (n) of each variable may differ due to missing data.

**Table 3.** Multivariate analysis of prevalence of prehypertension and associated factors in 1,773 without hypertension cared for by the Family Health Strategy in a city in Zona da Mata, MG, Brazil between October and August 2012

| Variables | Raw PR | CI 95% | p | Adjusted PR | CI-95% | P |
|---|---|---|---|---|---|---|
| Age (years) | | | | | | |
| 20-29 | 1.0 | | | | | |
| 30-39 | 2.1 | 1.4-3.1 | <0.001 | 1.8 | 1.2-2.7 | 0.001 |
| 40-49 | 4.0 | 2.84-5.77 | <0.001 | 3.3 | 2.3-4.8 | 0.001 |
| 50-59 | 4.7 | 3.28-6.78 | <0.001 | 3.9 | 2.6-5.6 | 0.001 |
| Race | | | | | | |
| Other | 1.0 | | | | | |
| African-Brazilian + biracial | 1.2 | 1.0-1.5 | | 1.2 | 1.0-1.5 | 0.020 |
| Family history of altered BP | | | | | | |
| No | 1.0 | | 0.012 | | | |
| Yes | 1.9 | 1.4-2.7 | | 1.0 | 1.2-2.3 | 0.002 |
| BMI | | | | | | |
| Normal | 1.0 | | <0.001 | | | |
| Overweight | 2.6 | 2.0-3.4 | | 1.5 | 1.0-2.1 | 0.012 |
| Waist circumference | | | | | | |
| Normal | 1.0 | | <0.001 | | | |
| Obesity | 2.8 | 2.1-3.6 | | 1.7 | 1.2-2.35 | 0.001 |

Isesuo[18] also notes that obesity in the fifth decade of life, from 40 to 49 years old, is also one of the factors associated with hypertension and prehypertension. The author considers this period of life to represent a time of transition from prehypertension to hypertension and that obesity and being overweight significantly contribute to the prevalence of prehypertension, though intervention is possible. The identification of anthropometric characteristics of a given group cared for by a health unit enables the establishment of primary healthcare measures intended to modify the epidemiological profile. According to Isezuo,[18] Guo *et al*.[21] and Gupta,[22] prehypertension is significantly associated with obesity and being overweight both in regard to BMI and waist circumference. In this study, the women who presented BMI higher than or equal to 25 kg/m$^2$ or waist circumferences equal to or higher than 88 cm, were more likely to present prehypertension.

Moreira *et al.*[23] found positive association between altered BP and anthropometric indicators. The author highlights in his studies that individuals with BMI>24.4 were 2.7 times more likely to present altered BP, in agreement with Jardim *et al.*[24] Moreira et al.[23] also observed that women with waist circumference greater than 80cm were 2.5 times more likely to present altered BP, a result similar to that found in this study. Sokondi *et al.*,[13] Lin *et al*.;[25] Singh *et al*.;[26] and Paz *et al.*[27] also found strong association between BMI and altered blood pressure. The multivariate analysis (Table 3) performed in this study shows that both BMI and waist circumference were significantly

associated with prehypertension. Rezende *et al.*[28] concluded that being overweight and waist obesity are correlated with most cardiovascular factors, with great impact on elevation of blood pressure.[24] Prehypertension is common in China's[14] urban areas and central obesity and being overweight are the main risk factors associated with this event. Nery *et al.*[12] verified that prehypertension is significantly associated with being overweight.[12,26]

Factors associated with cardiovascular risk, such as being overweight and obesity can be modified with the adoption of a healthy lifestyle and appropriate treatment, respectively. A healthy lifestyle is associated with normal blood pressure.[8,23] Age, being of African descent, and positive family history for hypertension are factors associated with altered blood pressure, widely disseminated in the literature.[8] Prehypertension may serve as a warning for healthcare workers, especially for individuals in the fifth decade of life, when it may represent a transition to hypertension.[4,23]

## Conclusion

Prehypertension gained prominence in recent decades in view of the benefits one may gain from preventing hypertension and cardiovascular complications. The topic has been discussed with the objective to alert healthcare professionals in regard to the possibility of it being an event that precedes hypertension. The prevalence of prehypertension, even though lower than that found in other studies, still calls for preventive and monitoring measures on the part of healthcare workers. The identification of prehypertension and its associated factors can contribute to the prevention of complications and enable improved health conditions, especially for populations at a higher risk such as those of African descent, overweight women, with abdominal obesity, between the fourth and fifth decade of life.

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