# Descriptive study of blood pressure values on economically active population

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**ABSTRACT**

**Introduction:** High blood pressure is one of the major modifiable risk factors of a series of diseases such as cardiovascular events, myocardial infarction, and heart failure. **Objectives:** To provide a descriptive overview of blood pressure values on an economically active population. **Methods:** Cross-sectional study. A group of 3 540 apparently healthy people was studied. They attended their annual check-up at The Preventive Medicine Service. **Results:** Average values of blood pressure were: 111.77 and 72.97mmHg for systolic and diastolic blood pressure, respectively. 9.44% of the whole of participants were found in the category of high blood pressure and 37.88% in the range of prehypertension. Half of the patients with prehypertension were approximately between 18 and 39 years old. **Conclusions:** Highly significant percentages are found, both of hypertension and prehypertension, which is a wake up call to intervene early, thus to reduce the high health and productive costs this entity involves.

**Key Words:** Blood pressure. Economically active population. Prehypertension. Preventive Medicine.

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**How to cite this article:** Torres-Zevallos H, Sosa JM, Mey A, Toce LM, Cornejo C, Carbajal J. Descriptive study of blood pressure values on economically active population. Interciencia. 2013;4(2):68-73

## INTRODUCTION

Blood pressure is one of the major factors of morbidity[1-3] and mortality[4-6] in the world. It is the main risk factor of stroke[7,8], myocardial infarction[9] and heart failure[10], and is one of the main modifiable factors, by which all the health care staff must be alert to detect and treat[11].

In 2002 the World Health Organization (WHO) estimated there should be one billion of individuals, and around 7.1 million of deaths per year, attributed to hypertension. Likewise, they indicate suboptimal blood pressure (systolic blood pressure higher than 115 mmHg) is responsible of 62% of the cases of stroke diseases, and 49% of ischemic coronary heart disease, with slight variations depending on gender. To sum up, suboptimal blood pressure is the first risk factor of death attributable throughout the world[12].

The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) establishes reference values of normal and suboptimal blood pressure, based on the greatest possible evidence and also committed to a constant re-assessment of them, which is reflected on the recurrent publications of reports[13]. There is a series of programs such as the Framingham Heart Study, which since 1948 is directed to identify cardiovascular risk factors and how they interact among them[14]. In 2002, WHO published the World Health Report 2002: Reducing risks, promoting healthy life[12], within which a large description of high blood pressure epidemiology is found. For about three decades, the National Heart, Lung, and Blood Institute (NHLBI)[15,16] has managed the National High Blood Pressure Education Program (NHBPEP), which has as one of its goals the issuance of guidelines, in order to disseminate among the population, the awareness of prevention, treatment and control of blood pressure. Another program of study aimed to estimate the prevalence of blood pressure is the National Health and Nutrition Examination Survey (NHANES)[17, 18], which thanks to the information provided, enables us to take preventive and promotional measures of health.

The objective of this study was to research blood pressure values in adult population, apparently healthy, attending to preventive health check-ups.

## PATIENTS AND METHODS

The study was made at the Preventive Medicine Service of the International Clinic in the city of Lima, where healthy subjects are commonly assessed. Most of these subjects are employees and workers of several companies, which have as their policy, to carry out preventive annual check-ups of health to their workers. 3 540 people were studied, 60.42% (n= 2 139) of female gender and 39.58% (n= 1 401) of male gender; 204 people were excluded of this study, which represents 5.45% out of the total, due to have high blood pressure as medical record. This information belongs to the period 2008.

For this procedure standardized methods were used, measurements and assessments were made at the Cardiology Service and at the Preventive Medicine Service. Patients were sat down for at least five minutes before the measurements were made[19]. Two measurements were made, taking for this study the average of them. A tensiometer Riester diplomat-presameter® was used, which is calibrated every six months, and whose armband has from 24 to 32 cm. Definitions to classify blood pressure values were based on the JNC VII (See Table 2).

The information input was processed using the statiscal software StataTM 10 (StataCorp, Texas-USA), quantitative variables were expressed in means and standard deviation, and qualitative variables were expressed in percentages. The difference among means was evaluated using the T-Test for two groups; Chi-square test was used for comparison of ratios. A value of $p < 0.05$ was considered statistically significant.

## RESULTS

Measurements of central tendency and dispersion of variables studied (Table 1) are shown.

It was found that 9.44% of the whole of individuals studied had values ≥ 140 mmHg of systolic blood pressure or ≥ 90 mmHg of diastolic blood pressure. It was also found that 37.88% of the population studied had values compatible with prehypertension (See Table 2).

The percentage of individuals with suboptimal blood pressure values (≥ 140 mmHg of systolic blood pressure or ≥ 90 mmHg of diastolic blood pressure) was estimated by gender, in different age groups (Figure 1 and Table 3).

We also present the means of systolic and diastolic blood pressure values by age and gender groups (Figure 2).

**Table 1**. Description of variables, means and standard deviation (SD) of blood pressure and age values.

| n = 3540 | Means | SD | IC 95 % | Mín - Máx |
|---|---|---|---|---|
| **Systolic blood pressure (mmHg)** | 111.77 | ± 13.99 | 111.31 - 112.23 | 80 - 190 |
| **Diastolic blood pressure (mmHg)** | 72.97 | ± 9.46 | 72.66 - 73.28 | 50 - 130 |
| **Age (years old)** | 38.52 | ± 11.29 | | 18 - 88 |

**Table 2**. Percentage found among the population studied about blood pressure classification according to the JNC 7.

| n = 3540 | Blood pressure levels (mmHg) | % (Total) | % (Female) n = 2 139 | % (Male) n = 1 401 |
|---|---|---|---|---|
| **Normal** | < 120/80 | 52.68 | 65.83 | 32.62 |
| **Pre Hypertension** | 120-139 / 80-89 | 37.88 | 29.78 | 50.25 |
| **Hypertension** | | | | |
| **Stage 1** | 140-159/90-99 | 6.50 | 2.99 | 11.85 |
| **Stage 2** | ≥ 160/100 | 2.94 | 1.40 | 5.28 |
| **Total** | | 100 | 100 | 100 |

## DISCUSSION

The connection among hypertension, cardiovascular disease and mortality has been well recognized[1-10,20]. Since the JNC VII, prehypertension category was established and it has particular importance because of its considerable prevalence[21-23], moreover, a large group of people within this category will develop hypertension in a few years, Vasan *et al.* of the National Heart, Lung, & Blood Institute's Framingham Heart Study found that progression from prehypertension to hypertension was 37.3% (CI 95% 33.3-41.5%) in people under 65 within a period of four years[14]. In addition, diverse studies show that prehypertension is a risk factor by itself[24] in the development of diabetes[25], alteration in cardiovascular function and structure[26]. Then, prehypertension is now considered a public health problem[27-29].

This study shows blood pressure values in an economically active population; about half of the population studied, who is apparently healthy, has high blood pressure values (hypertension and prehypertension). Our most striking finding is the percentage of people in prehypertension range, with a significant difference between genders (much higher in men). These findings are similar to those ones found in a study of working population in Hungary[30], in which the percentage found of prehypertension was 39.8%; however, in our study, patients who already had a diagnosis of hypertension were excluded, which did not happen in the study made in Hungary; another important thing to note is that our outcomes are higher than those reported in the U.S.A[24] and Jamaica[31] (30% approximately). 51.8% out of all the people in

**Table 3**. Blood pressure by gender and age group.

| | 18-29 years | | | 30-39 years | | | 40-49 years | | | 50-59 years | | | 60-69 years | | | >70 years | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Hypertension | | Total | Hypertension | | Total | Hypertension | | Total | Hypertension | | Total | Hypertension | | Total | Hypertension | |
| | n | n | % | n | n | % | n | n | % | n | n | % | n | n | % | n | n | % |
| **Male** | 281 | 26 | 9.25 | 539 | 70 | 12.99 | 293 | 61 | 20.82 | 196 | 56 | 28.57 | 68 | 19 | 27.94 | 24 | 8 | 33.33 |
| **Female** | 553 | 3 | 0.54 | 736 | 13 | 1.77 | 509 | 35 | 6.88 | 257 | 21 | 8.17 | 65 | 17 | 26.15 | 19 | 5 | 26.32 |
| **p** | | | < 0.0005 | | | < 0.0005 | | | < 0.0005 | | | < 0.0005 | | | 0.817 | | | 0.619 |

*Percentage of individuals with systolic blood pressure levels higher than or equal to 140 mmHg, and diastolic blood pressure higher than or equal to 90 mmHg. p: statistical significance (Chi square) when comparing gender ratios in each age group.*

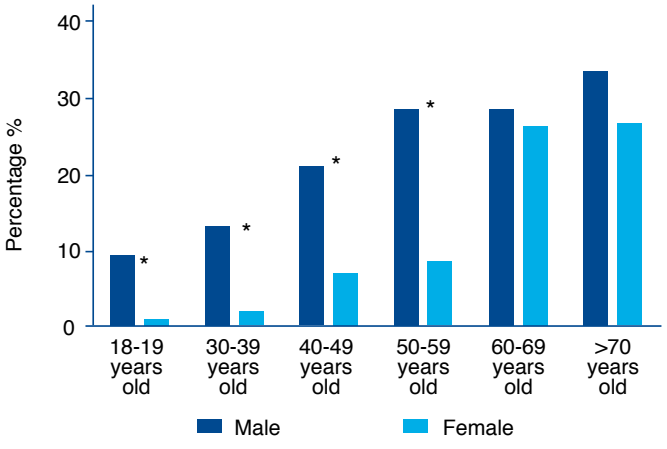


**Figure 1.** Percentage of individuals with systolic blood pressure levels higher than or equal to 140 mmHg, and diastolic blood pressure higher than or equal to 90 mmHg, by age and gender group. Both genders are compared in each age group, showing the respective statistical significance. *p < 0.05.

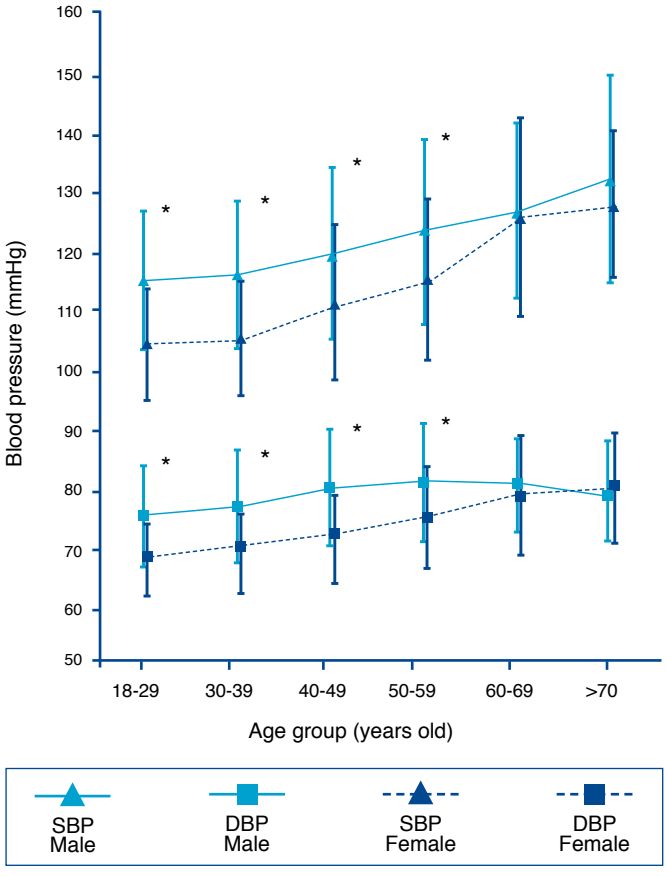


**Figure 2.** Mean and standard deviation values of systolic and diastolic blood pressure, by gender and age group.
*(*) Statistically significant differences (p < 0.05), when comparing (T test) mean values between both genders. This is valid for both systolic and diastolic blood pressure.*

**Table 4**. Percentage of prehypertension by age and gender group.

| Age group | Total % | SD | [95% IC] | F% | M% |
|---|---|---|---|---|---|
| 18-29 | 17.90 | 1.05 | 0.16 - 0.20 | 16.33 | 19.32 |
| 30-39 | 33.93 | 1.30 | 0.31 - 0.36 | 28.73 | 38.64 |
| 40-49 | 24.16 | 1.17 | 0.22 - 0.26 | 27.32 | 21.31 |
| 50-59 | 16.41 | 1.01 | 0.14 - 0.18 | 19.94 | 13.21 |
| 60-69 | 5.67 | 0.63 | 0.04 - 0.07 | 5.97 | 5.40 |
| >70 | 1.94 | 0.38 | 0.01 - 0.03 | 1.72 | 2.13 |
| **Total** | | | | **100** | **100** |

*Observations = 1 341individuals*

prehypertension range is between 18 and 39 years old. These data are extremely important because of the economic impact in a very important stage of the productive life of people, because this means that, in a short term, a significant percentage will have hypertension, which represents an increased cardiovascular risk; renal, vascular, coronary comorbidity; loss of man-hours; increased costs of healthcare provider services, among others.

In conclusion, given the percentages found both of hypertension and prehypertension, it is very important to emphasize control measures. Intervention at diverse levels should be considered and mainly aimed at prevention, because when intervening on these factors, morbidity and mortality caused by hypertension is indirectly decreasing in a near future, reducing in this way the very high health and productive costs this entity involves.

GRANTS OR FUNDING RESOURCES

None.

CONFLICTS OF INTEREST

The authors do not report conflicts of interest regarding this manuscript.

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