Control of Arterial Pressure in Patients undergoing Anti-Hypertensive Treatment in Brazil - Controlar Brazil

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Abstract
Background: Blood pressure (BP) control is crucial in arterial hypertension (AH).

Objective: To determine the percentage of patients requiring specific BP control goals treated in medical offices throughout Brazil.

Methods: Each researcher, from a total number of 291, had to evaluate, through conventional BP measurement performed during five consecutive days, the two first patients treated on that day. We determined the number of hypertensive patients treated for at least four weeks who presented BP control, according to the goals established for the risk group they belonged to.

Results: A total of 2,810 patients were assessed in 291 centers. The individuals were divided in groups as follows: A (AH stages 1 and 2, low and moderate additional risk) = 1,054 (37.51%); B (AH and borderline BP, high additional risk) = 689 (24.52%); C (AH and borderline BP, very high additional risk, including diabetic patients) = 758 (26.98%) and D (AH with nephropathy and proteinuria > 1 g/l) = 309 (11%). The BP means in the population were: 138.9 ± 17.1 and 83.1 ± 10.7 mmHg. Factors associated with a worse BP control were: age, abdominal circumference, diabetes, smoking and coronary disease. The BP control percentages in each of the groups were, respectively: 61.7; 42.5; 41.8 and 32.4%.

Conclusion: The low BP control according to the predefined goals, as demonstrated in the results, reinforces the necessity to establish measures to promote better control rates. (Arq Bras Cardiol 2007;88(6):624-628)

Key words: Blood pressure/drug effects; antihypertensive agents/therapeutic use.

Introduction
Arterial hypertension (AH) is a disease directly or indirectly responsible for the high rates of morbidity and mortality caused by cardiovascular diseases (CVD). This is a common worldwide scenario.

The risk of cardiovascular events due to AH increases from BP means of 115 x 75 mmHg. For each 20 mmHg added to the systolic arterial pressure (SAP) or 10 mmHg added to the diastolic arterial pressure (DAP), there is a 2-fold risk increase, for both the occurrence of coronary artery disease (CAD) and cerebrovascular accident (CVA).

Therefore, the classifications of the BP behavior have become more stringent, considering values < 140 x 90 mmHg as necessary for certain groups of patients. Table 1 shows the BP levels for each group, according to the V Brazilian Hypertension Guidelines (V DBH), considering their degree of risk.

It is unquestionable that the BP control is directly related to the decrease in AH complications. Thus, it is of utmost importance that patients with high BP be treated, so that they can benefit from the anti-hypertensive treatment.

Nevertheless, in spite of the evidence demonstrating the risk of arterial hypertension, as well as the benefits of its treatment, the number of diagnosed patients receiving anti-hypertensive therapy that presents BP control is still small worldwide.

Studies have demonstrated that the benefits of AH treatment are more significant when the control is more stringent. In this context, guidelines that establish the therapy for hypertensive patients indicate BP goals to be attained with the treatment in specific groups with arterial hypertension (Table 1).

This concern has been seen worldwide and can be observed in recently published studies. In Brazil, there are no data regarding the prevalence of arterial hypertension in the general population, as well as on the control levels of patients undergoing therapy, under the same conditions of the studied population. Similarly, there are no data that express BP control in specific subgroups.

The present study was designed to evaluate the percentage of patients undergoing anti-hypertensive treatment that have...
attained the goals established for their specific condition, having been assigned to four pre-defined categories in medical offices and clinics throughout Brazil.

Methods

The data collection and assessment were carried out between February and June 2008, after the Ethics Committee in Research of HC-FMRP-USP approved the study, to be carried out in multiple centers as proposed in the presented protocol.

A total of 2,810 individuals were assessed by 291 medical research physicians, general practitioners, cardiologists or nephrologists, in medical offices, outpatient clinics or services of arterial hypertension, distributed throughout the four macroregions of Brazil as follows: North-Northeast region: 13.5%; Midwest region: 6.5%; Southeast region: 68% and South region, 12%.

The protocol determined that each researcher should evaluate, during five consecutive days, the two first patients treated at the office or clinic that met the study inclusion criteria. Patients with medical insurance, including the Brazilian Public Health System (SUS) were assessed, as well as those who were treated at private medical offices, with or without free access to medication.

Study characteristic

The present was an observational study and the data were obtained from patients treated in medical offices and outpatient clinics throughout Brazil.

The protocol did not foresee therapeutic intervention, aiming solely at observing, among others, the following aspects:

1. Relative number of patients undergoing treatment with SAP and DAP < 140 x 90 mmHg, respectively, menteregardless of their clinical condition;

2. Relative number of hypertensive patients who had presented, for at least four weeks, the control of systolic and diastolic arterial pressure, according to their individual goals, as established in Table 1;

3. Frequency of the associated clinical conditions in the assessed patients;

4. Patients undergoing monotherapy;

5. Patients undergoing treatment with an association of anti-hypertensive drugs.

Inclusion and exclusion criteria

Inclusion criteria

- Age ≥ 21 and < 80 years of either sex;
- Confirmed clinical diagnosis of hypertension and to be currently undergoing treatment with anti-hypertensive drug (monotherapy, fixed combination or open combination of drugs), according to the clinical history;
- Regular use of anti-hypertensive medication for at least four weeks;
- To be one of the two first patients assessed on the day;
- To accept participating in the study, after being informed on the study procedures, risks, benefits and rights and reading and signing the free and informed consent form.

Exclusion criteria

- Secondary arterial hypertension;
- Poor general health due to end-stage diseases;
- Pregnant or breastfeeding women and those who had given birth less than two months before;
- Regular use of corticosteroids, chemotherapy agents or immunosuppressive drugs;
- Chronic use of alcohol (daily or large amounts) or neuroleptic drugs;
- Participation in another observational study sooner than three months after their possible inclusion in the present study.

Criteria for data collections

The demographic data were collected by the researchers and included age (in full years); height (in meters); weight (in kg); body mass index (BMI = kg/m²), sex, current smoking status (smoker or nonsmoker); diabetic nephropathy (present or not); left ventricular hypertrophy, detected by the electrocardiogram (present or not); coronary and/or peripheral artery disease (present or not); heart failure (present or not); previous history of myocardial infarction and/or cerebrovascular accident, based on patients’ files or their evaluation during the consultation.

Information on the use of monotherapy or an association of drugs (fixed or open), as well as the medications being used for the treatment was also obtained by the researcher during patient evaluation.

Blood pressure measurement

The BP measurements were obtained according to the criteria established by the V DBH\textsuperscript{3} using an automatic Microlife sphygmomanometer, model 3 BT0A validated by the British Hypertension Society, AA qualification, with three
different cuff models, according to the patient’s condition: adult, thin adult and obese adult.

The BP was measured in the sitting position after 5 minutes of rest and two measurements were obtained consecutively, with a one-minute interval between them, with the objective of obtaining the actual BP value through the mean of these measurements. A third measurement was obtained, equally one minute after the second measurement, when the difference between the two first ones was > 5 mmHg.

Statistical analysis

Demographic data, as well as data on physical examination, associated clinical conditions and current antihypertensive treatments were descriptively summarized. The classificatory variables were described through the distribution of frequencies and percentages. Means, standard deviations, minimum and maximum values were used to describe continuous variables.

Exact confidence intervals for the binomial distribution, with a 95% confidence interval (95%CI) were established for the proportion of patients that had achieved their goals for BP control, when considering the total number or the subgroups of patients. Factors that were predictive of BP control were explored by adjusting a logistic linear model. The factors predictive of non-control were also assessed using the same model.

The SAS system (Statistical Analysis System), release 9.1.3 was used to perform all statistical analyses.

Results

Characteristics of the studied individuals

A total of 2,810 patients from 291 centers were assessed. The data on the individuals included in the study, as well as the prevalence of the clinical conditions and the associated risk factors are shown in Table 2.

As for the risk stratification used to define the four groups, the distribution was as follows: Group A (hypertension 1 to 2 with low or middle risk): 1,054 (37.51%); Group B (hypertension or borderline behavior with high risk): 689 (24.52%); Group C (hypertension or borderline behavior with very high risk): 758 (26.98%) and Group D (arterial hypertension and kidney disease with protein loss > 1 g/24 h): 309 (10.99%) (Table 3).

Arterial pressure control

In total analysis, regardless of the individual’s condition, 1,497 (53.3%) of them presented BP < 140 x 90 mmHg.

Considering the specific control targets desired for each of the groups, we obtained the following number of patients with systolic and diastolic arterial pressure control: Group A: 650 (61.7%); Group B: 293 (42.5%); Group C: 317 (41.8%) and Group D: 100 (32.4%). These data are shown in Table 4.

Associated clinical conditions

The numbers and percentages of the clinical conditions

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Data obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>60.4 ± 12.4</td>
</tr>
<tr>
<td>Height (meters)</td>
<td>1.63 ± 0.9</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1,095 (37.7%)</td>
</tr>
<tr>
<td>Female</td>
<td>1,810 (62.3%)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>75.9 ± 15.4</td>
</tr>
<tr>
<td>Abdominal circumference (cm)</td>
<td>96.9 ± 12.5</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>28.49 ± 4.9</td>
</tr>
<tr>
<td>Waist: hip ratio</td>
<td>0.94 ± 0.09</td>
</tr>
<tr>
<td>Smoking (number and percentage)</td>
<td>242 (8.4%)</td>
</tr>
<tr>
<td>Arterial pressure (mmHg)</td>
<td>138.8 ± 17.1 x 83.1 ± 10.7</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>563 (20.77%)</td>
</tr>
<tr>
<td>Diabetic nephropathy</td>
<td>52 (1.92%)</td>
</tr>
<tr>
<td>Obesity</td>
<td>1,049 (38.71%)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>1,736 (64.06%)</td>
</tr>
<tr>
<td>LV hypertrophy (through ECG)</td>
<td>461 (17.01%)</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>376 (13.87%)</td>
</tr>
<tr>
<td>Peripheral artery disease</td>
<td>135 (4.98%)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>67 (2.47%)</td>
</tr>
<tr>
<td>Previous history of myocardial infarction</td>
<td>153 (5.65%)</td>
</tr>
<tr>
<td>Previous history of cerebrovascular accident</td>
<td>78 (2.88%)</td>
</tr>
<tr>
<td>No comorbidity</td>
<td>366 (13.51%)</td>
</tr>
<tr>
<td>Other comorbidities</td>
<td>255 (9.41%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk stratification</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>1,054 (37.51)</td>
</tr>
<tr>
<td>Group B</td>
<td>689 (24.52)</td>
</tr>
<tr>
<td>Group C</td>
<td>758 (26.98)</td>
</tr>
<tr>
<td>Group D</td>
<td>309 (10.99)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>Desired level</th>
<th>Number (%) assessed</th>
<th>Number (%) controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&lt;140 x 90 mmHg</td>
<td>1,054 (37.51)</td>
<td>650 (61.7)</td>
</tr>
<tr>
<td>B</td>
<td>&lt;130 x 85 mmHg</td>
<td>689 (24.52)</td>
<td>293 (42.5)</td>
</tr>
<tr>
<td>C</td>
<td>&lt;130 x 80 mmHg</td>
<td>758 (26.98)</td>
<td>317 (41.8)</td>
</tr>
<tr>
<td>D</td>
<td>&lt;120 x 75 mmHg</td>
<td>309 (10.99)</td>
<td>100 (32.4)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,810 (100)</td>
<td>1,360 (46.5)</td>
</tr>
</tbody>
</table>
associated with arterial hypertension in the studied group can be seen in Table 2.

**Treatment with monotherapy or with an association of drugs**

In the four groups with different risk levels, 913 of them (32.5%) used monotherapy, whereas the other 1,897 (67.5%) used more than one anti-hypertensive drug. The distribution of therapeutic classes being used during the study is shown in Table 5.

Figure 1 shows the percentage of patients that met the goals established for each one of the four risk classes they were allocated in.

**Impact of associated factors and blood pressure control**

Using a model of logistic regression, it was possible to establish that for each year of life added to the studied individual, the probability of BP control was 2% lower. A similar observation was verified regarding the abdominal circumference, by verifying that for each centimeter added to this parameter, the chance of BP control was also 2% lower.

As for the smoking status, the presence or not of diabetes mellitus and the presence or not of coronary artery disease, these chances of control were, respectively, 29%, 59% and 17% lower (Figure 2).

**Discussion**

The evaluation of arterial hypertension prevalence, awareness, treatment and control has been the object of global study, due to the importance of the topic.

The knowledge of BP control in specific groups according to their risk stratification, however, has not been established in private medical offices and outpatient clinics (private medical care system) in Brazil.

Isolated data obtained from assessed health units (secondary and tertiary public medical centers and healthcare facilities) have demonstrated wide-ranging BP control levels.

Among the population of the town of Tubarão, state of Santa Catarina, Brazil, the percentages of BP prevalence, awareness, treatment and control were, respectively: 40.5%; 55.6%; 46.8% and 21.6%

Mion et al assessed the BP control in patients treated at

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### Table 5 - Percentage distribution of patients treated with monotherapy and by classes used in the treatment and number of associated drugs

<table>
<thead>
<tr>
<th>Type of treatment</th>
<th>Number (%) of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monotherapy</td>
<td>913 (32.5)</td>
</tr>
<tr>
<td>ARB II</td>
<td>369 (40.5)</td>
</tr>
<tr>
<td>ACEI</td>
<td>210 (23)</td>
</tr>
<tr>
<td>CCA</td>
<td>210 (23)</td>
</tr>
<tr>
<td>Beta-blocker</td>
<td>150 (16.5)</td>
</tr>
<tr>
<td>Diuretics</td>
<td>103 (11.3)</td>
</tr>
<tr>
<td>Association</td>
<td>1,897 (67.5)</td>
</tr>
<tr>
<td>2 drugs</td>
<td>1,210 (63.8)</td>
</tr>
<tr>
<td>3 drugs</td>
<td>502 (26.5)</td>
</tr>
<tr>
<td>More than 3 drugs</td>
<td>184 (9.7)</td>
</tr>
</tbody>
</table>

**Notes:**
- ARB II - angiotensin II receptor blocker; ACEI - angiotensin-converting enzyme inhibitors; CCA - calcium channel antagonists.
10 hypertension leagues (São Luís, Maceió, Salvador, Goiânia, Rio de Janeiro, three in São Paulo, Porto Alegre and Sorocaba) and found that in a total of 1,998 individuals, 56% of them presented BP < 140 x 90 mmHg\textsuperscript{12}.

Among patients treated at the Hypertension Outpatient Clinic of HC FMRP USP, in Ribeirão Preto, followed during the year of 1995, 33.3% of them presented BP < 140 x 90 mmHg\textsuperscript{13}.

Mancia et al\textsuperscript{14} observed that even in large clinical trials, usually very stringently monitored, the level of BP control did not show the desired results.

When these assessments favor groups in which the control goals are necessarily lower, these values tend to be even lower\textsuperscript{9}.

The main results of the present study indicate a control rate of systolic and diastolic arterial pressure in the global analysis of 53.3%, regardless of which subgroup they refer to. Considering the specific subgroups of patients from medical offices and outpatient clinics from the different regions of the country, 61.7% in Group A (AH stages 1 and 2 with low and moderate risk); 42.5% in Group B (AH and borderline BP with high risk); 41.8% in Group C (AH and borderline BP with very high risk, including diabetics) and 32.4% in Group D (AH with nephropathy and proteinuria > 1 g/l) had achieved the desired BP goals.

It is worth mentioning that, in the present study, which focused on a population who had or did not have free access to medication, these control percentages, apparently high in comparison to what is observed in the general population, are still below the expected ones.

Ma and Randall\textsuperscript{15} evaluated the BP treatment and control in medical offices in the United States between 2003 and 2004. The mean BP observed by the authors was 141 x 81 mmHg in patients without comorbidities and 143 x 79 mmHg in those who presented associated diabetes or nephropathy.

In the present population, the general mean of BP was 138.8 ± 17.1 x 83.1 ± 10.7 mmHg. Whereas in the United States these authors found 42% of individuals without comorbidities with BP < 140 x 90 mmHg, in the present study, among those classified as belonging to Group A (AH stages 1 and 2 with low and moderate risk), 61.7% presented BP control. Regarding the group considered by the authors as presenting the higher risk (patients with associated diabetes and/or nephropathy), this rate, considering an ideal BP level < 130 x 80 mmHg, was 20%. This rate was approximately 30% to 40% in a population with a similar profile in the present study. Interestingly, when assessing the drugs more frequently used in the United States, it was observed that diuretics were the first choice (46%), followed by ACEI (37%), beta-blockers (36%) and ARB II (24%). When assessing the medications that are generally prescribed in Brazilian medical offices, the order is different (Table 5), with ARB II being the ones most frequently prescribed. However, the use of medications in monotherapy or in association with other drugs exhibits a very similar situation when comparing the medical practice in the Unites States with that in Brazil. In that study, 58% of the patients used a combination of medications, whereas the present study shows that 67.5% of patients did the same.

Another study, by McInnis et al\textsuperscript{16}, observed that only 49% to 51% of the patients evaluated by them received monotherapy. This study, which was carried out in Canada, showed that 62% of the patients used ARB II, similarly to what was observed in the present study. The percentages of patients with controlled BP in the present study, according to the goals defined by the V DB H and also by other similar documents, are optimistic in comparison to other observations. It is, however, necessary to mention that for Groups A, B, C and D we have, respectively, 38.3%; 57.5%; 58.2% and 67.6% of individuals with noncontrolled BP.
Due to their importance and impact, the associations of individual variables, which, when present, act as additional risk factors and can interfere with the desired BP control, were also assessed. In this sense, we observed that for each centimeter added to the abdominal circumference or for each year of life gained, the BP control is reduced by 2%. Similarly, the habit of smoking, the presence of diabetes mellitus and coronary artery disease were determinants of a lower chance of blood pressure control (Figure 2).

New evidence has shown that the abdominal circumference is an acknowledged risk factor for cardiovascular disease caused by increased visceral fat\textsuperscript{19}. The present study showed that this parameter increased the difficulty to control the BP, even for small variations such as 1 cm.

The more difficult BP control presented by patients with diabetes and nephropathy, is due, among other factors, to the fact this population has lower BP goals than those presented by individuals without these diseases, with the objective of protecting target organs from vascular injury caused by hypertension\textsuperscript{19,21}.

A final observation is opportune and necessary. Why is the blood pressure control so seldom achieved? Perhaps that is the biggest challenge to be overcome by all professionals who work with arterial hypertension.

Ogedegbe\textsuperscript{22} and Nobre et al\textsuperscript{13}, among others, studied the reasons why patients do not maintain a continuing treatment and only a small percentage of them achieve BP control. The factors that contribute to the low rate of BP control are focused on variables associated with the physician and the patient and must be considered: low adherence to prescriptions, medication costs, personal beliefs on the treatment and the disease itself, low frequency of consultations, adverse effects, among others.

It is, however, necessary to seek better BP control, considering the evidence regarding the benefits obtained with its control.

The present study brings contributions regarding the identification of the number of individuals undergoing treatment in medical offices and clinics in Brazil, who present BP control according to the established goals and their clinical conditions.

It is also useful so that actions can be taken in search of better control rates, based on the conclusions drawn by the study.

Nevertheless, it has limitations. Among them, we should mention that the sample is not representative of the population of patients with arterial hypertension in Brazil, but rather of those patients treated in private clinics and medical offices (vs. those treated at the Brazilian Public Health System - SUS). For this reason, one must state that these data refer to this specific study population.

Finally, it is worth mentioning that the selection of the participating centers was not randomly performed, but defined by the willingness of the individuals invited to participate in the study.

Researchers participating in the Controlar BRAZIL Study

References


