

Temporary Limitations in Daily Routine Activities: Association with Arterial Pressure and Antihypertensive Therapy

Gilberto Senechal de Goffredo Filho, Eduardo Faerstein

Departamento de Epidemiologia, Instituto de Medicina Social, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ - Brasil

Abstract

Background: Arterial hypertension has a crucial role in the occurrence of severe clinical events, but there are controversies regarding the impact of the arterial pressure levels or anti-hypertensive medication on the routine activities of individuals.

Objective: To verify whether the increase in arterial pressure levels or anti-hypertensive medications determine a temporary incapacity for routine activities.

Methods: Analysis of sectional data of 2,953 participants, from 1999-2001, of a cohort of university employees in Rio de Janeiro (Pro-Saude Study). The occurrence and duration of the incapacity on the 14 days before data collection were assessed according to the measured level of arterial pressure, as continuous variable and with the stratification of the participants in four groups, combining the information regarding the arterial pressure (< or \geq 140/90 mmHg) and the reported use of anti-hypertensive medications. A multinomial logistic regression was carried out, with multiple adjustments for sex, age, ethnicity, *per capita* household income and report of comorbidities.

Results: The adjusted odds ratio for the association between the use of anti-hypertensive medication and incapacity for 8 to 14 days was 2.08 (95% CI: 1.25-3.48), and 0.92 (95%CI: 0.84-1.01) for the association between a 10-mmHg increase in systolic pressure and incapacity for up to 7 days.

Conclusion: Temporary incapacity for 8 to 14 days associated to anti-hypertensive medications might be related to its adverse effects. Among other reasons, the suggestive inverse association between the systolic pressure and incapacity for up to 7 days can be related to the phenomenon of hypoalgesia, sometimes described by hypertensive individuals. (Arq Bras Cardiol 2010; 94(4):445-450)

Key words: Hypertension; antihypertensive agents/adverse effects; sickness impact profile.

Introduction

Arterial hypertension (AH) has a highly acknowledged role in the genesis of health disorders, with strong individual and collective impact, such as coronary disease, cerebrovascular accident (CVA) and chronic kidney disease¹. A less often studied aspect of AH is its potential impact on the individual's routine activities, which can occur through different mechanisms of the aforementioned target-organ lesions.

First, there is the possibility of occurrence of biological effects, directly related to the elevated blood pressure (BP) levels. Most current evidence suggests that AH, at least at the mild to moderate range, is asymptomatic², and an association, for instance, between AH and headaches³, is still controversial. Second, the use of anti-hypertensive medication

can determine a worse quality of life for the individual⁴, due to the drug-induced symptoms.

Finally, hypertensive individuals can adopt specific attitudes, such as work absenteeism and limitations in social or leisure activities⁵ simply because they see themselves as individuals who have a disease, in a process called "labeling".

The temporary incapacity for performing routine activities, defined as a temporary restriction in the individual's usual functional capacity⁶, is a health status indicator recommended by the World Health Organization (WHO) for population studies and can be useful to determine the impact of a disease or condition on the daily life of an individual.

The present study investigated whether the AH determines a temporary incapacity for routine activities, specifically through the direct effect of pressure levels or indirectly, through the effect of the antihypertensive drug therapy.

Methods

We analyzed the data from the Pro-Saude Study, a longitudinal research that evaluated technical-administrative

Mailing address: Gilberto Senechal de Goffredo Filho •

Rua Henrique Dias, 453 - Retiro - 25680-301 - Petrópolis, RJ - Brasil

E-mail: senechal330@gmail.com

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employees from a university located in the state of Rio de Janeiro. The target population was identified through a combination of lists supplied by the Human Resources Department of the Institution, by the Payroll Department and directly by their Units and Sectors. Employees that had been allocated at other institutions and those on leave of absence due to problems other than health reasons were excluded.

Three phases of data collection have been carried out: 1999, 2001 and 2006-2007. The entire process of the data collection in the three phases was carried out by trained teams of researchers, supervisors and field coordinators. Daily, the questionnaires were revised and typed in duplicate and independently. Specifically regarding the BP, the field researchers were trained using the material produced by the British Medical Journal⁷. The quality control included the detection of a possible terminal digit bias and the fortnightly evaluation of the proportion of absent data and identical BP measures.

In our cross-sectional study, we used data obtained from the second phase of the study, related to the participants of the two first phases of data collection. Of the 4,177 employees eligible to participate in the cohort, information was obtained from 3,253 of them. After the exclusion of two employees aged older than 80 years and participants with missing data (267 regarding the temporary incapacity and 31 regarding the BP), our study population consisted of 2,953 participants (70.7% of the eligible individuals).

Two BP measurements were carried out and the mean of the two measures was used in the study. The use of antihypertensive medication was assessed through the questions: "Have you taken any medication during the last 7 days?". In case of an affirmative answer, the participant informed the type of medication, and the latter was categorized as antihypertensive or not by two independent codifiers. Subsequently, the individuals were categorized in four groups related to exposition: 1. Those with BP < 140/90 mmHg and no report of anti-hypertensive medication; 2. Those with BP \geq 140/90 mmHg and also no report of anti-hypertensive medication; 3. Those that reported the use of anti-hypertensive medication and presented BP < 140/90 mmHg; 4. Those who reported the use of anti-hypertensive medication and presented BP \geq 140/90 mmHg. This procedure allowed the isolated analysis of the elevated BP levels and medication use as potential determinants of temporary incapacity.

As outcome, we considered the occurrence and duration of episodes of temporary incapacity to perform daily routine activities on the 14 previous days, assessed through the question: "During the last two weeks, were you incapable of performing any of your daily routine activities (such as, for instance, working, studying, leisure activities, or housework) due to a health problem that you have or had?"; the participant that reported a temporary incapacity, would then answer the following question: "During the last two weeks, for how many days were you incapable of performing any of your daily routine activities (such as, for instance, working, studying, leisure activities, or housework) due to this (these) health problem(s) that you have or had?"

Based on the observed distribution, our outcome was grouped in three categories of participants: those that did not report incapacity, those who reported incapacity for a period of up to 7 days and those who reported it for a period of 8 to 14 days.

Some variables were considered potential confounders. Age, body mass index (IMC in kg/m²) and family income *per capita* (in minimum wages pertinent to the time of the study) were treated as continuous variables and we applied to the latter a logarithmic transformation, due to the fact that its distribution presented a large asymmetry to the right. We treated as categorical variables: sex, ethnicity (self-defined by the participant), presence of comorbidities (the participant that reported being told by his physician that he/she had "diabetes" and/or "high cholesterol" was considered as having comorbidities) and degree of schooling, with stratification in three categories: participants with complete Elementary School; complete High School and complete College/University.

After the descriptive analysis of the data and the assessment of the proportion of individuals with BP levels \geq 140/90 mmHg, of those receiving antihypertensive medication and the frequency and duration of the temporary incapacity, we performed an evaluation of the prevalence and duration of the temporary incapacity among the four aforementioned exposition categories. The systolic and diastolic BP means were also investigated in the three groups regarding the outcome (no incapacity and shorter or longer duration of the incapacity).

Subsequently, we performed a multivariate analysis through a multinomial logistic regression to assess the influence of potential confounding factors using odds ratio as a measure of the magnitude of the association. The use of this model was based on the absence of the intrinsic ordinality between the outcome categories⁸. We used two different models in the analysis. In the first, the exposition was treated using the four described categories, with the group of reference being those individuals with BP < 140/90 mmHg and no use of medication and the outcome with the mentioned compound variable. In the second model, we used the systolic and diastolic BP levels in mmHg as continuous variable, multiplied by 10 and the use of antihypertensive medication as a dichotomous variable, as exposition variables.

The potential confounding variables were sequentially introduced in the models: initially, sex, age, and ethnicity; subsequently, those that were related with the socioeconomic position, such as degree of schooling and family income *per capita*; finally, we included the body mass index (BMI) and the presence of comorbidities.

The covariables that modified the punctual estimate of the association between exposition and outcome in more than 10% or that were associated to a p value < 0.05 in its association with the outcome were kept in the model. The mentioned analyses were repeated after the exclusion of the interviewees that reported a previous diagnosis of myocardial infarction (MI), angina or cerebrovascular accident (CVA). The statistical procedures were carried out using the Stata 9.1 program.

These protocols were submitted to and approved by the Committee of Ethics in Research of the university where the study was performed. The participants were informed on the Pro-Saude Study and its objectives and signed the Free and Informed Consent Form.

Results

Table 1 shows the distribution of the covariables in the 2,953 participants, with a slight predominance of female individuals, Caucasians, from the group with a family income *per capita* of up to three minimum wages and individuals with a higher degree of schooling. The frequencies of reports of the previous diagnosis of comorbidities (diabetes mellitus or dyslipidemia) and of angina, MI or CVA are found in the same table. The mean age of the participants was 41.7 years (varying from 24 to 69 years) and BMI varied from 15.6 to 64.1, with a mean of 26.2 and a median of 25.5 (data not shown in the table).

A total of 495 participants presented BP \geq 140/90 mmHg and 452 reported using antihypertensive medication; the composition of the four strata that were formed based on these characteristics is shown in Table 2, as well as their mean BP levels.

Temporary incapacity to perform the daily routine activities in the two previous weeks was reported by 704 participants (23.8%), with a mean duration of 3.9 days and a median of 2 days. Among those that reported the time of incapacity, the latter lasted up to 7 days in 551 (83%) and 8 to 14 days in 113 (17%).

The highest prevalence of temporary incapacity was reported by the group that used medication and presented a BP < 140/90 mmHg (Table 2). The same table shows that the lowest prevalence of incapacity was found among the individuals with high BP, without use of medication. We observed a higher mean time of incapacity among the individuals that reported the use of antihypertensive drugs (Table 2).

The mean systolic and diastolic BP in the groups with or without temporary incapacity are shown in Table 3 and there were no clinically relevant differences in the levels between these groups.

At the regression analysis that used the exposure as categorical variable, we observed that the group of individuals with BP < 140/90 mmHg and reported the use of antihypertensive medication presented a higher chance of temporary incapacity for 8 to 14 days and that this effect did not persist in the group that reported medication use, but presented BP \geq 140/90 mmHg (Table 4). Among the participants with BP \geq 140/90 mmHg without medication, there was a suggestion, with a borderline statistical

Table 1 - Demographic characteristics of the participants

Variables	n (%)
Sex (n = 2,953)	
Male	1,284 (43.5)
Female	1,669 (56.5)
Ethnicity (n = 2,830)	
Caucasians	1,536 (54.3)
Brazilian mulattoes	863 (30.5)
Blacks	431 (15.2)
<i>Per capita</i> household income (in minimum wages) (n = 2,849)	
Up to 3	1,050 (36.9)
From 3 to 6	952 (33.4)
> 6	847 (29.7)
Degree of schooling (n = 2,904)	
Up to elementary school	588 (20.2)
High school	1,022 (35.2)
College or university	1,294 (44.6)
Report of comorbidities (n = 2,900)	
Yes	739 (25.5)
No	2,161 (74.5)
Report of angina, myocardial infarction or cerebrovascular accident (n = 2,953)	
Yes	94 (3.2)
No	2,859 (96.8)

Observation: the total numbers differ among the variables due to missing data.

Table 2 - Distribution of the participants according to the measured blood pressure (BP) and use of antihypertensive medication, means and standard deviations (SD) of systolic and diastolic BP and prevalence and mean time of temporary incapacity for routine activities in the groups

Groups	n (%)	Systolic BP (mean \pm SD, mmHg)	Diastolic BP (mean \pm SD, mmHg)	Prevalence of temporary incapacity (%, 95%CI)	Mean time of incapacity in days (95%CI)
BP < 140/90 mmHg, no medication	2,263 (76.6)	111.1 \pm 11.9	70.3 \pm 9.4	23.6 (21.8 - 25.3)	3.6 (3.3 - 4.0)
BP \geq 140/90 mmHg, no medication	238 (8.1)	145.5 \pm 15.0	90.5 \pm 10.8	16.8 (12.0 - 21.6)	4.1 (2.5 - 5.6)
BP < 140/90 mmHg, using medication	295 (10.0)	118.6 \pm 11.4	73.8 \pm 8.9	31.9 (26.5 - 37.2)	5.2 (4.1 - 6.3)
BP \geq 140/90 mmHg, using medication	157 (5.3)	154.0 \pm 17.3	92.1 \pm 12.2	23.6 (16.9 - 30.3)	5.9 (3.9 - 7.9)

Table 3 - Mean systolic and diastolic arterial pressure (in mmHg) in the groups with or without temporary incapacity

	Temporary incapacity in the last 14 days		
	Absent	Up to 7 days	8 to 14 days
SAP (IC 95%)	117.2 (116.4 - 117.9)	115.0 (113.7 - 116.4)	118.5 (114.5 - 122.1)
DAP (IC 95%)	73.6 (73.1 - 74.1)	72.8 (71.9 - 73.8)	74.3 (71.8 - 76.8)

SAP - systolic arterial pressure; DAP - diastolic arterial pressure.

significance, of a lower chance of temporary incapacity for up to 7 days.

In the model that used the BP level as the continuous variable, we observed a tendency toward a lower chance of occurrence of temporary incapacity for up to 7 days for each increase of 10 mmHg in the systolic BP, once again, with no formal statistical significance being attained. The use of antihypertensive medication is associated with a higher chance of temporary incapacity for 8 to 14 days (Table 5).

The results remained practically unaltered when the analyses were repeated with the exclusion of the individuals that reported previous episodes of angina, MI or CVA (data not shown).

Discussion

In our study, we observed a higher occurrence of incapacity for daily routine activities for 8 to 14 days in individuals that reported the use of antihypertensive medication. In the model that used BP as the categorical variable, this association between the use of medication and incapacity persisted in individuals with BP < 140/90 mmHg, and was not observed in individuals with BP ≥ 140/90 mmHg.

Among those participants that did not report the use of antihypertensive medication or, considering the BP level, we observed an inverse association, with borderline statistical significance between BP and incapacity for up to 7 days of duration.

The fact that there was no change in the results after the exclusion of the participants that reported a previous

diagnosis of angina, MI or CVA reinforces the idea that the associations observed here are not related to the presence of these complications.

We did not find in the literature a study that had assessed the possible effects of AH on temporary incapacity for routine activities. Using a similar variable, Tsai et al⁹ observed a higher number of missed work days among hypertensive individuals. Tirado et al¹⁰ verified a higher frequency of temporary work incapacity and also a higher number of missed days at work among hypertensive individuals. We emphasize that these studies do not focus on the mechanism through which the AH determines the mentioned incapacity. We believe that the occurrence of adverse events constitutes a plausible explanation for the higher prevalence of temporary incapacity observed among individuals that reported the use of antihypertensive medication, mainly when we observe that the use of the drugs is associated with the incapacity for 8 to 14 days, suggesting an effect associated with the daily use, or at least, the frequent use of the medication.

Our results are consistent with other studies, such as the one by Lawrence et al⁴ and Roca-Cusachs et al¹¹, who observed a direct association between the number of drugs used and a worse assessment of the quality of life in hypertensive individuals. Considering that the presence of undesirable effects is an important determinant of poor treatment adherence, as pointed out in the 5th Brazilian Guidelines on Arterial Hypertension¹², these data reinforce the broadly disseminated idea concerning the need to establish a pharmacological therapeutic regimen with a minimum of undesirable effects.

The cross-sectional design of the present study limits the possible inferences made based on the association

Table 4 - Adjusted odds ratio* for temporary incapacity according to the blood pressure (BP) level and use of antihypertensive medication

Groups	Temporary incapacity	
	Up to 7 days OR (95%CI)	From 8 to 14 days OR (95%CI)
BP < 140/90 mmHg, no medication (n = 2.007)	1.00	1.00
BP ≥ 140/90 mmHg, no medication (n = 200)	0.64 (0.40 - 1.03)	0.82 (0.36 - 1.86)
BP < 140/90 mmHg, using medication (n = 272)	1.26 (0.91 - 1.76)	2.25 (1.31 - 3.87)
BP ≥ 140/90 mmHg, using medication (n = 137)	0.68 (0.41 - 1.15)	1.09 (0.47 - 2.53)

*Adjusted by sex, age, ethnicity, family income per capita and report of comorbidities.

Table 5 - Adjusted odds ratio* for temporary incapacity according to the increase in systolic and diastolic blood pressure (BP) and antihypertensive medication

Variables	Temporary incapacity	
	Up to 7 days OR (95%CI)	From 8 to 14 days OR (95%CI)
Increase of 10 mmHg in systolic BP	0.92 (0.84 - 1.01)	0.89 (0.74 - 1.07)
Increase of 10 mmHg in diastolic BP	1.11 (0.97 - 1.26)	1.04 (0.81 - 1.35)
Use of antihypertensive medication	1.14 (0.85 - 1.56)	2.08 (1.25 - 3.48)

*Adjusted by sex, age, ethnicity, family income per capita, report of comorbidities and constant variables of the table.

found between the use of antihypertensive medication and temporary incapacity. We cannot rule out the possibility of reverse causality, that is, that the perception of any symptom led the participant to seek medical assistance and that the antihypertensive medication was indicated based on the observation of high BP during this episode. However, if the incapacity episode had caused the posterior use of medication in most participants, we would probably also have found an association between the use of the drug and the shorter-term incapacity, which did not occur.

Additionally, the report of medication use in the present study does not encompass the information on the degree of treatment adherence, which can vary considerably. Few Brazilian studies have assessed the degree of adherence to antihypertensive therapy, with large variation in results. The rate of adherence to the prescribed medication observed among low-socioeconomic level patients in the city of Salvador was 11%, whereas 67% of the patients in a Geriatrics Ambulatory in the city of Ribeirão Preto presented full adherence¹³; it is not possible, therefore, to make any inference regarding this aspect for the studied population. The difference in the association with the temporary incapacity observed between the groups that reported the use of medication, but presented BP < 140/90 mmHg or \geq 140/90 mmHg, might be related with several degrees of treatment adherence. It is possible that the individuals from the group with elevated BP reported the use of drugs, but their degree of adherence is lower, which would justify their higher BP levels and lower effect of the medication in terms of temporary incapacity.

Another possible explanation for the higher prevalence of temporary incapacity among the individuals with elevated BP that reported the use of antihypertensive medication is the fact that they might have adopted a higher degree of self-care, such as more frequent visits to the health professionals and a consequent "incapacity" to perform their daily routine activities on these occasions. This aspect was not controlled in our analyses due to the absence of data regarding it in the study. However, we consider that if this phenomenon had been responsible for a higher frequency of temporary incapacity, this fact would have also occurred for the incapacity up to 7 days, which was not observed.

Regarding the tendency toward an inverse association between elevated systolic BP and incapacity for up to 7 days, we can hypothesize whether it is correlated with the phenomenon, observed by some authors, of AH-related hypoalgesia. This phenomenon was initially described by Zamir and Shuber¹⁴ that detected a higher threshold for pain through stimulus of the dental pulp in hypertensive men, when compared to normotensive ones. Based on that report, several authors have documented this phenomenon associated to pain in other places and through other stimuli. Schobel et al¹⁵ observed an inverse association between the perception of pain through mechanical skin stimulus and the mean BP level, measured at a moment immediately before the stimulus. Duschek et al¹⁶ observed a lower pain threshold induced by a thermal stimulus in hypotensive individuals, when compared to normotensive ones, which indicates the existence of this phenomenon

even at those BP levels below the ones that characterize AH. It is possible that the impact of the events that are the possible causes of pain in the daily life of hypertensive individuals is lower than in those with normal BP. Hagen et al¹⁷ found a lower prevalence of musculoskeletal pain in several anatomic locations in individuals with higher BP. Tronvik et al¹⁸ verified that higher systolic BP and pulse pressure were associated with a lower prevalence of non-migraine headaches in the general population.

In the present study, which can be considered a mid-sized one, the measurements were performed under strict standardization and quality control and such procedures are of great importance to guarantee the reliability of the obtained data. Differently from most studies that assess the impact of AH on the daily life by simply classifying the participants as hypertensive or normotensive, we also used the measured BP level. The present study also innovates by investigating the impact of high blood pressure levels through the temporary incapacity to perform daily routine activities, which consists in a different approach from the usual focus on AH-related severe events. Some limitations of the study must be pointed out. The BP level that we used refers to the mean of two measurements performed on a single day; considering the BP variations throughout time, we cannot affirm that the level obtained necessarily represents the usual BP level on the 15 days prior to the measurement. This limitation must be emphasized, considering that the individual's measured BP might have undergone some influence due to a recently adopted change in behavior (or even of the use of antihypertensive medication).

Among the covariables used in this model, it is necessary to remember that the classification of the individual as presenting comorbidities was made based on the morbidity reported by the participant. Considering the possibility that there is an association between the temporary incapacity and the diseases considered in this classification (especially diabetes mellitus, with its symptoms), we cannot rule out the fact that there might be some degree of residual confounding, due to possibility that the individual is not aware of having such condition.

As this is a cross-sectional study, a selective survival bias can occur, in which the most severely affected hypertensive individuals were excluded at an early stage from the population due to death or retirement caused by AH complications. Thus, the results found do not necessarily apply to the hypertensive individuals with a more unfavorable evolution, and the research in this subgroup of individuals would require a different study design.

One could also hypothesize that certain individuals would present a tendency to underestimate or voluntarily omit the occurrence of temporary incapacity, as the data collection was carried out in the work environment. We believe this was a rare occurrence, due to emphasis given by the collection team on data confidentiality, the explanation that it referred to any of the individual's daily routine activities and due to a certain "dilution" effect due to the fact that the question was among several others in the questionnaire, which were not directly related to it.

Subsequent analyses will be developed based on the results presented here, such as the occurrence of temporary incapacity among hypertensive individuals using different types of medications, which can provide important data on treatment options with a lower impact on the daily life of the individuals, and the observation of the prevalence of several reasons related to the incapacity, which will allow the more direct investigation, in this study population, of the hypothesis of hypoalgesia associated to arterial hypertension.

Conclusion

Regarding the BP levels, our findings are consistent with the hypothesis that higher pressure levels can determine a lower frequency of temporary incapacity for a period of up to 7 days, and at least within the range of not very high levels, the data suggest absence of a negative impact of the pressure levels on the individual's everyday life.

We also observed an association between the use of antihypertensive drugs and a higher frequency of a longer duration of the temporary incapacity, which reinforces

the importance of being careful when implementing antihypertensive pharmacological therapy.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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