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## ASSOCIATION BETWEEN TREATMENT COMPLIANCE AND DIFFERENT TYPES OF CARDIOVASCULAR COMPLICATIONS IN ARTERIAL HYPERTENSION PATIENTS

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**ABSTRACT:** This cross-sectional analytical study was carried out at 23 Family Health Centers in Fortaleza-CE, Brazil. The objective was to verify the link between anti-hypertension treatment compliance and the types of cardiovascular complications present in hypertensive patients. The sample was composed of 182 hypertensive patients registered in the *Sistema de Gestão Clínica de Hipertensão Arterial e Diabetes Mellitus da Atenção Básica* who accepted to answer and fill in a structured form and an instrument to assess compliance. Among the arterial hypertension patients questioned, 62.0% were women, 66.9% were elderly people, 52.2% were patients with a family income between 1.5 and four monthly minimum wages, 61.2% had between one and eight years of education and 60.4% lived in households with two to four people. The most frequent complications found were cerebrovascular accident (37.9%) followed by acute myocardial infarction (20.3%). Treatment compliance was present in 52.0% of patients and was associated to cerebrovascular accident ( $p < 0.001$ ; OR=3.048; 95% CI=1.633-5.681). The results obtained suggest the need for a behavioral change in hypertensive patients, adopting health promotion measures in order to prevent further cardiovascular complications.

**DESCRIPTORS:** Hypertension. Complications. Cardiovascular disease. Patient compliance. Primary health care.

## ASSOCIAÇÃO ENTRE ADESÃO AO TRATAMENTO E TIPOS DE COMPLICAÇÕES CARDIOVASCULARES EM PESSOAS COM HIPERTENSÃO ARTERIAL

**RESUMO:** Estudo transversal, analítico, realizado em 23 Centros de Saúde da Família de Fortaleza, Ceará, Brasil. O objetivo foi verificar a associação entre adesão ao tratamento anti-hipertensivo e tipos de complicações cardiovasculares presentes em pessoas com hipertensão arterial sistêmica. A amostra foi constituída por 182 hipertensos cadastrados no Sistema de Gestão Clínica de Hipertensão Arterial e Diabetes Mellitus da Atenção Básica que aceitaram responder a um formulário estruturado e um instrumento para medir a adesão. Dos hipertensos, 62,0% eram mulheres, 66,9% idosos, 52,2% com renda familiar variando de 1,5 a quatro salários mínimos, 61,5% possuíam escolaridade entre um e oito anos de estudo e 60,4% residiam com duas a quatro pessoas no domicílio. As complicações mais prevalentes foram acidente vascular cerebral (37,9%), seguido de infarto agudo do miocárdio (20,3%). A adesão ao tratamento esteve presente em 52,0% e associou-se com acidente vascular céfálico ( $p < 0,001$ ; OR=3,048; IC95%=1,633-5,681). Os resultados demonstram a necessidade de mudança comportamental da clientela hipertensa com adoção de medidas de promoção da saúde a fim de prevenir novos agravos cardiovasculares.

**DESCRIPTORIOS:** Hipertensão. Complicações. Doenças cardiovasculares. Cooperação do paciente. Atenção primária à saúde.

## ASOCIACIÓN ENTRE ADHESIÓN AL TRATAMIENTO Y TIPOS DE COMPLICACIONES CARDIOVASCULARES EN PERSONAS CON HIPERTENSIÓN ARTERIAL

**RESUMEN:** Estudio transversal y analítico, realizado en 23 Centros de Salud Familiar en Fortaleza-CE, Brazil. El objetivo fue verificar la asociación entre adhesión al tratamiento anti-hipertensivo y los tipos de complicaciones cardiovasculares presentes en personas con hipertensión arterial. La muestra estuvo compuesta por 182 pacientes hipertensos registrados en el *Sistema de Gestão Clínica de Hipertensão Arterial e Diabetes Mellitus da Atenção Básica* que aceptaron responder a un formulario estructurado y a un instrumento para medir la adhesión. Entre los pacientes hipertensos cuestionados, 62,0% fueron mujeres, 66,9% ancianos, 52,2% pacientes con ingresos familiares variando entre 1,5 a 4 salarios mínimos, 61,5% poseían entre 1 y 8 años de escolaridad y 60,4% residían en hogares habitados por dos a cuatro personas. Las complicaciones prevalentes fueron accidente cerebrovascular (37,9%) seguido de infarto del miocardio (20,3%). La adhesión al tratamiento estuvo presente en un 52,0% y fue asociada al accidente cerebrovascular ( $p < 0,001$ ;  $OR = 3,048$ ;  $IC95\% = 1,633-5,681$ ). Los resultados obtenidos demuestran la necesidad de un cambio en el comportamiento de los pacientes hipertensos, adoptando medidas de promoción de la salud para prevenir nuevas complicaciones cardiovasculares.

**DESCRIPTORES:** Hipertensión. Complicaciones. Enfermedades cardiovasculares. Cooperación del paciente. Atención primaria de salud.

### INTRODUCTION

Globally appointed as an important risk factor for cardiovascular diseases, systemic arterial hypertension (SAH) is an increasingly common health problem, due to the increased longevity and prevalence of factors like obesity, physical inactivity and inappropriate diets.<sup>1</sup> An analysis per region indicated prevalence levels of SAH corresponding to 56.6% in Africa, followed by Malaysia (46.5%) and South America (46.5%).<sup>2</sup> In Brazil, more than 30 million people suffer from SAH, including 35.8% of adult men and 30% of women. It is also associated with high socioeconomic costs, which affect society, families and individuals, culminating in 40% of early retirements.<sup>3</sup>

Silent, slowly evolving and asymptomatic, in most cases, it is only perceptible after a cardiovascular event, in which the quality of life can be compromised beyond repair or even imply death. Hence, for many hypertensive patients, as a result of the asymptomatic nature of the disease, SAH is not considered as something that requires continuous care, contributing to low treatment compliance and increased risk of complications.

Evidence appoints that hypertensive patients do not feel the need to modify habits related to work, the social midst and the family dynamics until complications from the disease emerge.<sup>4</sup> A study shows that hypertensive patients started to follow the therapeutic regimen only after complications had appeared, such as cerebrovascular accident (CVA), acute myocardial infarction (AMI), coronary artery disease (CAD), congestive heart failure (CHF), left ventricular hypertrophy (LVH), renal failure and peripheral vascular ischemia.<sup>5</sup>

Therefore, compliance with anti-hypertensive treatment represents a key element for blood pres-

sure control and, consequently, for the prevention of cardiovascular complications.

Compliance is defined as the patient's level of response to his treatment in cases of continuous medication use, diet, lifestyle changes, as well as his attitude towards health professionals' recommendations.<sup>6</sup>

Although the importance of treatment compliance has been disseminated, the behavior is not observed frequently. In a population-based research undertaken in ten countries from Latin America, it was demonstrated that, among 48.3% of adults diagnosed with SAH, only 15.5% have their pressure levels under control.<sup>2</sup> In Brazil, part of the hypertensive patients who maintain blood pressure levels  $< 140 \times 90$  mmHg (57.6%)<sup>7</sup> use their medication correctly (36.5%) and comply with the therapeutic measures, mainly when involving changes in eating habits, abandonment of addictions like smoking and alcoholism and incorporation of physical exercise.<sup>8</sup>

Studies appoint that non-compliance with medication causes unnecessary adjustments to the therapeutic regimen due to the lack of positive response to the treatment, besides increasing health care costs and hospitalization rates, emergency consults and the treatment of complications.<sup>1,9-12</sup>

In this conjuncture, the availability of systematic monitoring data on the association between cardiovascular complications and compliance is essential. Considering that few Brazilian studies have focused on treatment compliance<sup>7-8,10,13-15</sup> and cardiovascular complications<sup>16-20</sup> alone in the Family Health Strategy, and that the few studies that explore the interdependence of these variables were developed at specialized services,<sup>21-22</sup> further exploration of this research field is needed. In view of the above, the following question is raised: what complications of SAH are associated with treat-

ment compliance in people monitored in the Family Health Strategy (FHS)?

Clarifications on the association between specific complications of hypertension and treatment compliance can guide the planning of public health actions towards better care for this population and the non-occurrence of new complications. Thus, the objective in this study was to verify whether anti-hypertensive treatment compliance is associated with types of cardiovascular complications present in SAH patients monitored in the FHS.

## METHOD

An analytic study was undertaken at 23 Family Health Centers (FHC) distributed in the area of six Regional Secretaries (RS) in Fortaleza-CE, Brazil. The *Sistema de Gestão Clínica de Hipertensão Arterial e Diabetes Mellitus da Atenção Básica* (Clinical Management System of Arterial Hypertension and Diabetes Mellitus in Primary Health Care/SIS-HIPERDIA) was used to select the study participants.

Among the 14,200 users registered in SIS-HIPERDIA, of all FHC in Fortaleza, 1315 contained registers of associated complications, who were distributed among 71 out of 92 municipal FHC and constituted the research population. As the objective was to verify the association between treatment compliance and the types of cardiovascular complications, a sample had to be outlined that contained SAH patients who presented a type of cardiovascular complication (such as CVA, AMI, CAD, CHF, LVH), justifying the composition of the sample with people suffering from SAH complications.

To calculate the sample, the prevalence of compliance was estimated at 13.24%, according to compliance studies,<sup>13</sup> with a 95% confidence interval and a 5% estimation error, resulting in a sample of 161 users. Considering a 20% error margin, the sample consisted of 193 users. Although the prevalence used in the calculation dates back to 2009, a prospective study confirms the low treatment compliance level in hypertensive patients with complications, with an average compliance of 25.1%, minimum of 9.9% in victims of CVA and maximum of 27.3% in dyslipidemic patients.<sup>14</sup>

The delimitation of the FHC that participated in the study was based on the calculation of the 50% percentile (P50) of the range in the number of patients registered in SIS-HIPERDIA from the 71 health centers. Therefore, from each RS, the service with the largest number of registered patients was taken and subtracted from the service with

the smallest number of registered patients. Based on the result, P50 was calculated. Thus, four FHC were calculated per RS. At one RS, only three FHC complied with the criterion adopted, totaling 23 ( $5 \times 4 + 3 = 23$ ) FHC where the number of registered patients surpassed P50.

The sum of the number of patients registered in the SIS-HIPERDIA who belonged to the 23 selected FHS resulted in 681 users in total, among which they were drawn proportionally to the number of patients enrolled per FHC. The 193 hypertensive patients were included in the research through a table with random numbers. Eleven hypertensive patients were excluded from the study, six died after being registered and five did not live at the address registered. Thus, in the end, 182 users with SAH and associated complications registered in SIS-HIPERDIA in the city were located, complied with the inclusion criteria and agreed to participate in the research.

The following inclusion criteria were adopted: hypertensive patients registered in SIS-HIPERDIA who suffered from a cardiovascular complication and were in good mental conditions to answer the questionnaire used. Users who no longer lived at the address registered or who had deceased after the registration were excluded.

With the cooperation of the local health team and the community health agents, the users drawn were identified in the community. After the patient had agreed to participate and signed the informed consent form, the data were collected through home visits to residences located within the coverage area of the six RS in the city between April and July 2012.

To define compliance or not to the anti-hypertensive treatment, the tool by Moreira<sup>23</sup> was used, which is a multidimensional Likert-type scale, based on the Classical Test Theory (CTT), developed in his doctoral dissertation. The factorial analysis of the tool demonstrated that it contains two dimensions and measures the compliance in its pharmacological and non-pharmacological aspects. The tool consists of ten items, five from the non-pharmacological dimension (salt intake, fat consumption, abstinence from smoking, absence of alcohol intake, coping from stress) and four in the pharmacological dimension (appropriate medication use, attendance to consultations, body mass index (BMI) and blood pressure (BP)), besides sedentariness as an isolated factor.

Each item has five possible answers, ranging from 0.0 to 1.0 points. The total score for the questionnaire is ten. The author also standardized the

answers, considering the scores as follows: ideal compliance from 9 to 10 point; mild non-compliance between 7 and <9; moderate non-compliance between 5 and <7; severe non-compliance between 3 and <5; and very severe non-compliance between 0 and <3. As the tool is based on the CTT, whose test result corresponds to the sum of the subjects' answers, compliance was considered satisfactory when the total score corresponded to 7 or more, also considering that, based on this score, the subject practiced most of the recommendations for SAH treatment.<sup>23</sup>

Statistical analysis was applied, using the chi-squared and odds ratio to verify whether the complications present were associated with the compliance. The normality of all variables was test using the Kolmogorov-Smirnov test. Statistical significance was set as  $p < 0.05$ .

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## RESULTS

Among the 182 hypertensive patients who participated in the study, treatment compliance was present in 52.0%. Most of the patients visited were women (62.0%), elderly (66.9%), with a mean age of 64.5 years ( $\pm 11.9$ ), family income between 1.5 and 4 minimum wages (52.2%), education between one

and eight years of study (61.5%), and living with two to four people at home (60.4%) (Table 1).

**Table 1 - Sociodemographic characteristics of people with systemic arterial hypertension and associated complications, registered in SIS-HIPERDIA. Fortaleza-CE, Brazil, 2012. (n=182)**

Sociodemographic characteristics	f	%
Sex		
Male	69	38.0
Female	113	62.0
Age range		
< 60 years	60	33.1
≥ 60 years	122	66.9
Family income*		
00 - 1.5 minimum wage	71	39.0
1.5 - 4.0 minimum wages	95	52.2
4.0 - 14.0 minimum wages	16	8.8
Education		
Cannot read/write	36	19.8
Up to 9 years of study	112	61.5
> 8 years of study	34	18.7
Number of people at home		
Lives alone	14	7.7
2 to 4 people	110	60.4
5 to 7 people	52	28.6
8 to 15 people	06	3.3

\*Minimum wage valid in 2012: R\$ 622.00

Concerning the complications, CVA was the most frequent (37.9%), followed by AMI, which affected about one fifth (20.3%). CVA and AMI were the most frequent complications in men, with 52.2% and 21.7%, respectively. Among the women, CVA (29.2%) was identified, followed by other complications (24.8%), such as angina, arrhythmia and coronary failure (Table 2).

**Table 2 - Distribution of cardiovascular complications in arterial hypertension patients registered in SIS-HIPERDIA, according to sex. Fortaleza-CE, Brazil, 2012. (n=182)**

Complication	Sex	
	Female f (%)	Male f (%)
Cerebrovascular accident	33 (18.1)	36 (19.8)
Acute myocardial infarction	22 (12.1)	15 (8.2)
Coronary artery disease	12 (6.6)	01 (0.6)
Congestive heart failure	13 (7.1)	05 (2.8)
Left ventricular hypertrophy	04 (2.2)	02 (1.1)
Revascularization	01 (0.5)	02 (1.1)
Other complications*	28 (15.4)	08 (4.4)

\*Angina, arrhythmia and coronary failure.



When relating the types of complications with anti-hypertensive treatment compliance (Table 3), it was verified that the complications were about twice more frequent in hypertensive patients with treatment compliance, except for CVA. Among the

patients who are executing the correct treatment, both CVA and AMI were present in 13.2%. As for patients who were not complying with the treatment, a fourth (24.7%) of the users had been CVA victims.

**Table 3 – Association between anti-hypertensive treatment compliance and types of complications present in hypertensive patients registered in SIS-HIPERDIA. Fortaleza-CE, Brazil, 2012. (n=182)**

Complication	Compliance		OR [95%]	P
	Yes f (%)	No f (%)		
Cerebrovascular accident	24 (13.2)	45 (24.7)	<b>3.048 [1.633 – 5.681]</b>	<b>&lt;0.001</b>
Acute myocardial infarction	24 (13.2)	13 (7.1)	1.978 [0.935 – 4.185]	0.071
Coronary artery disease	08 (4.4)	05 (2.8)	1.544 [0.485 – 4.913]	0.459
Congestive heart failure	13 (7.1)	05 (2.8)	2.664 [0.908 – 7.813]	0.066
Left ventricular hypertrophy	04 (2.2)	02 (1.1)	1.911 [0.341 – 10.704]	0.454
Revascularization	02 (1.1)	01 (0.5)	1.891 [0.168 – 21.233]	0.600
Other complications*	19 (10.4)	17 (9.4)	1.058 [0.510 – 2.196]	0.880

\*Angina, arrhythmia and coronary failure.

Treatment compliance was only associated with CVA ( $p < 0.001$ ), in that hypertensive patients who do not follow the correct treatment had 3.048 more chance of CVA (Table 3).

## DISCUSSION

Despite the larger proportion of women in this study, global rates indicate that the difference in SAH prevalence between the sexes is small, probably due to the higher prevalence in younger men and older women.<sup>24-25</sup>

In Brazil, the women perceive their health problems more and visit health services more than men.<sup>16</sup> This can be related to the fact that more health programs existed at the FHC focused on women when compared to men, or can suggest that women are more concerned with their own health, besides the fact that, in most cases, even when working, the women serve as health providers at their homes, accompanying the children to the health services and thus facilitating the access to the activities and health teams.<sup>26</sup>

The literature appoints a higher prevalence of hypertension in elderly people. The population is ageing and the number of individuals reaching the eighth decade of life is increasing. It is known that blood pressure increases with age, reaching more than 60% in the age range of 65 years,<sup>19</sup> which can be explained by the changes characteristic of ageing, making the individual more prone to the development of SAH and, consequently, to the complica-

tions deriving from the non-control of pressure levels. In addition, the increasingly early diagnosis of SAH is observed in the population.

Concerning education, in a study involving a similar population, the maximum education level for 63.7% of the hypertensive patients was primary education.<sup>20</sup> With regard to the other sociodemographic characteristics, a population-based study to estimate the prevalence of hypertension with and without complications identified that 52.3% lived at homes with four to seven people and almost all (98.3%) presented a *per capita* family income of less than five minimum wages.<sup>16</sup>

Sociodemographic differences play an important role in the health conditions due to different factors, such as the access to the health system, information level, understanding of the problem and treatment compliance. Based on several studies, in one investigation,<sup>1</sup> it was evidenced that the rates of cardiovascular diseases are higher in the lower socioeconomic classes.

As for the cardiovascular complications, CVA was the most frequent in the hypertensive patients studies. Persistent high pressure levels modify the histology of the cerebral artery walls, making them more prone to ruptures that lead to CVA.<sup>27</sup> Nevertheless, in a study<sup>17</sup> that involved 415 hypertensive patients in the South of Brazil, left ventricular hypertrophy (27.5%) was found, followed by CVA (7.2%), coronary failure (7.0%) and chronic kidney failure (6.7%) as the most prevalent complications in the study population. In another population-based

study,<sup>28</sup> the load of comorbidities was investigated in hypertensive Americans, showing that 81.8% suffered from chronic kidney failure, CAD (73.0%), CHF (71.4%) and CVA (69.5%).

It can be presupposed that these diverging findings were based on sample differences and the sociocultural context the hypertensive patients are inserted in. Despite the difference between the studies, however, a high prevalence of cardiovascular complications is observed, which can be explained by the Western lifestyle Brazilians and North American have in common.

On the opposite, in a European population with healthier eating habits (Mediterranean diet), low prevalence rates of cardiovascular complications were found, in view of the research undertaken in Cataluña, involving 9001 hypertensive patients with complications, identifying only 6.0% with CVA, 5.3% CAD and 2.6% CHF.<sup>29</sup> It is highlighted that the pharmacological treatment compliance of the hypertensive patients studied corresponded to 81.3%.<sup>29</sup>

When considering the presence of complications according to sex, we consider that the higher prevalence of CVA and AMI in men can be related with its abrupt incidence and the fact that this population visits the health services less. Men often do not engage in the therapeutic monitoring needed, making them more susceptible to cardiovascular events. In women, the high prevalence of CVA is associated with the specific risks for this morbidity, such as the use of hormones. The other complications affecting the female sex can be related with the higher demand for health services and the initial detection of cardiovascular morbidities like angina, arrhythmia and coronary failure, which precede the AMI itself.

When relating compliance with anti-hypertensive treatment and complications, it was verified that the complications were twice as frequent in the anti-hypertensive patients who complied with the treatment, except for CVA. As the compliance was measured after the complication, it can be inferred that the complications served as an alert to provoke behavioral changes, improving these patients' compliance. In CVA patients, no improvements in compliance were perceived, perhaps due to the fact that this disease is highly disabling in most cases, compromising the patient's autonomy, reducing the mobility and hampering the accomplishment of activities of daily living.

Treatment compliance is one of the main factors that minimize the risk of complications of SAH, as it results in blood pressure control. Therefore,

in people who comply with the anti-hypertensive treatment, a reduction in the incidence or delay in the occurrence of cardiovascular complications is expected, as well as improvements in the quality of life.<sup>30</sup>

Concerning CAD, compliance was better when compared to patients without this complication. Nevertheless, the association was not significant. In a study with a cross-sectional design,<sup>22</sup> developed at a secondary prevention clinic for cardiac illnesses in Rio Grande do Sul, low treatment compliance was appointed among CAD patients, mainly related to the non-pharmacological management of the disease, similar to the present findings. This can be explained by the difference in the research scenarios, as the study<sup>20</sup> was developed at a referral center for patients with complications and monitoring problems, while the present study was developed at primary health care services.

In another study,<sup>22</sup> it was shown that the low compliance involving CAD was associated with low monitoring and understanding of the medication prescribed, with low socioeconomic levels and an unsatisfactory interdisciplinary approach.

Another important aspect in the reduction of cardiovascular morbidity and mortality was the pharmacological treatment. This impact is observed in several sources of evidence, like in the Canadian Hypertension Education Program, which started in 1999 and, since then, has provoked a great increase in diagnosis and treatment rates. By 2003, the number of individuals diagnosed with hypertension and under treatment had increased by 65.1% and 77.0%, respectively. Besides the reduction in the annual mortality by CVA, CHF and AMI, a significant drop occurred in hospitalization by CVA and CHF when comparing the periods before and after 1999.<sup>30-31</sup> In that sense, in a study undertaken in Rio Grande do Sul,<sup>32</sup> the low compliance with medication treatment was the main cause of decompensation of the CHF.

As regards myocardial revascularization, although the percentage in this study was low, the importance of analyzing this result is highlighted with a focus on monitoring by health professionals, considering that even patients who have not undergone this intervention present risk factors. A study involving a similar population showed a high percentage of revascularization and angioplasty (37.7%) in people who did not have their blood pressure under control, calling for the design of more effective care.<sup>33</sup>

Nevertheless, despite the advance in the diagnosis and treatment of SAH, a study<sup>34</sup> has shown that

only one third of the people regularly monitored at health services maintain their blood pressure within the desired rates. In another study,<sup>16</sup> the proportion of users with BP<140x90 mmHg after the start of the medication treatment ranged between 6% and 25%, evidencing low levels of treatment compliance based on lack of blood pressure control. Besides the established treatment, compliance is needed to maintain the BP within ideal levels.

It is highlighted that all hypertensive patients in this study already suffered from some complication related to SAH and were able to improve their treatment compliance after a cardiovascular event. In a cross-sectional study<sup>16</sup> of 385 hypertensive patients registered in a family health service in Londrina-PR, hypertensive patients with a background history of stroke and cerebrovascular accident showed better compliance with the pharmacological treatment (78.7%).

The high percentage of comorbidities found suggests late diagnosis, insufficient treatment of SAH when compared to studies<sup>16,29</sup> that found low prevalence rates of complications associated with SAH and the high prevalence of cardiovascular risk factors.<sup>35</sup> In that sense, new studies are needed to identify the causes of lack of success in anti-hypertensive treatment. Besides low compliance, difficulties to have access to medication and health services need to be taken account, as well as the effectiveness of the therapeutic schemes used, the health professionals' conduct towards the hypertensive patients, the influence of the side effects of the drugs and the cultural aspects in the approach and control of the disease.

In this context, the role of nursing is highlighted, directly involved in care for hypertensive clients at the different healthcare levels. It is known that treatment compliance is a complex process that involves social and personal factors, justifying the low levels presented around the world. Nevertheless, it is fundamental for nursing to recognize and find mechanisms to improve compliance with SAH treatment, and thus minimize the occurrence of complications. Hence, in care delivery to SAH clients, the need to modify the clients' behavior needs to be emphasized, as well as the need to adopt health promotion measures.

## CONCLUSION

Treatment compliance was present in 52.0% and was only associated with the CVA ( $p<0.001$ ). It was verified that the hypertensive patients who do

not follow the correct therapeutics had 3.048 times more chance of this event. This implies that the FHS professionals need to establish new strategies to improve compliance with the anti-hypertensive treatment, with a view to preventing new cardiovascular complications.

Concerning the study limitations, the compliance tool is highlighted, which considers a certain time period as a reference for the answers. Hence, one cannot say that compliance or non-compliance is constant over a longer period. Another limitation is the cross-sectional design, which is able to perceive the relation between the variables analyzed, but the sense of this influence cannot be affirmed. In addition, the great effort involved in the countless visits to locate these almost 200 hypertensive patients across the municipal territory is highlighted. Many home were distant, and sometimes even in dangerous areas, requiring great effort from the researchers to make the visit.

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