Association between the 8-item Morisky Medication Adherence Scale (MMAS-8) and Blood Pressure Control

Alfredo Dias Oliveira-Filho[1,2], José Augusto Barreto-Filho[3], Sabrina Joany Felizardo Neves[2], Divaldo Pereira de Lyra Jr.[1]

Laboratório de Ensino e Pesquisa em Farmácia Social (LEPFS), Departamento de Farmácia, Universidade Federal de Sergipe[1]; Departamento de Enfermagem e Farmácia, Universidade Federal de Alagoas[2]; Departamento de Medicina, Universidade Federal de Sergipe[3], SE - Brazil

Abstract

Background: Non-adherence to treatment is an important and often unrecognized risk factor that contributes to reduced control of blood pressure (BP).

Objective: To determine the association between treatment adherence measured by a validated version in Portuguese of the 8-item Morisky Medication Adherence Scale (MMAS-8) and BP control in hypertensive outpatients.

Methods: A cross-sectional study was carried out with hypertensive patients older than 18 years, treated at six of the Family Health Strategy Units in Maceió (AL), through interviews and home blood pressure measurements, between January and April 2011. Adherence was determined by MMAS-8 version translated for this study. The patients were considered adherent when they had a score equal to 8 at the MMAS-8.

Results: The prevalence of adherence among the 223 patients studied was 19.7%, while 34% had controlled BP (> 140/90 mmHg). The average adherence value according to the MMAS-8 was 5.8 (± 1.8). Adherent patients showed to be more prone (OR = 6.1, CI [95%] = 3.0 to 12.0) to have blood pressure control than those who reached mean (6 to <8) or low values (<6) at the adherence score. The Portuguese version of MMAS-8 was showed a significant association with BP control (p = 0.000).

Conclusion: The diagnosis of non-adherent behavior through the application of MMAS-8 in patients using of antihypertensive medications was predictive of elevated systolic and diastolic BP. (Arq Bras Cardiol 2012;99(1):649-658)

Keywords: Medication adherence; blood pressure; outpatients; health systems.

Introduction

In patients with systemic arterial hypertension (SAH), non-adherence is an important and often unrecognized risk factor that contributes to the reduced control of blood pressure (BP), leading to the development of other cardiovascular diseases such as heart failure, coronary artery disease, renal failure and cerebrovascular accident[1].

Studies comprehending five decades have estimated that 20% to 50% of patients do not take their medications as prescribed[2]. According to the World Health Organization (WHO), in developed countries, non-adherence of patients with chronic diseases is around 50%, being probably higher in developing countries[3].

Although the prevalence and implications of non-adherence on clinical outcomes have been increasingly acknowledged, the true impact of measures known to be effective in BP control, such as cost-free pharmacotherapy given at outpatient clinics, provided by the Brazilian Public Health System (SUS), particularly through the Family Health Strategy, is still ignored[4]. Thus, the systematic diagnosis of non-adherence is crucial to investigate its impact on clinical outcomes.

In this context, the most widely used method of adherence assessment is the Morisky Medication Adherence Scale (MMAS 4- item version)[5]. Recently, a new eight-item scale (MMAS-8), which has greater reliability (a = 0.83 vs. = 0.61)[6], created with the objective of determining adherence to antihypertensive treatment, was developed from the MMAS-4 and supplemented with additional items designed to address several aspects of adherence behavior. In Brazil, studies evaluating non-adherence with the new scale are still recent and scarce[7].

The present study aimed to determine the relationship between adherence measured from a validated version in Portuguese of the MMAS-8 and BP control in hypertensive outpatients treated by the Family Health Strategy teams.

Methods

Study design, setting and period

A cross-sectional study was carried out by applying a structured interview to hypertensive patients treated by the Family Health Strategy teams.

Mailing Address: Divaldo Pereira De Lyra Jr. •
Cidade Universitária Prof. "José Aloísio de Campos" - Av. Marechal Rondon, s/n Jardim Rosa Elze. Postal Code 49100-000, São Cristovão, SE - Brazil.
E-mail: lepfs.ufs@gmail.com, lyra_jr@hotmail.com
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The interviews occurred in six Family Health Units (USF) of Maceio linked to the second edition of Health Tutorial Education Program (PET-Saude II) between January and April 2011.

Study Population

We selected patients with confirmed diagnosis of hypertension who were treated at the USF, aged 18 or older and who used antihypertensive medications. Patients with secondary hypertension confirmed by medical records or who had purchased at least one antihypertensive drug in the thirty days preceding the interview were excluded. This exclusion criterion was aimed to eliminate the interference of the cost of drugs, one of the major predictive factors of nonadherence[8].

Interviews and assessed variables

The interviews were carried out in the patients' houses, by previously trained students of pharmaceutical sciences who were members of the PET-Health and who were monitored during the home visit by a health agent of the USF. The following variables were investigated: gender, age, schooling, regular physical activity, alcohol consumption, smoking, drugs, amount of medication, time of use of antihypertensive drugs, systolic blood pressure (SBP), diastolic blood pressure (DBP) and blood pressure control, characterized by BP values < 140/90 mmHg, respectively.

Patients with uncontrolled blood pressure were classified as patients with resistant or pseudoresistant hypertension, according to the literature[9-11]. The values of systolic (SBP) and diastolic (DBP) blood pressure were obtained by the mean of two blood pressure measurements, carried out by the research team during the visit, according to the guidelines established in the VI Brazilian Guidelines for the Treatment of Hypertension[9], using a mercury sphygmomanometers calibrated with a minimum interval of 5 minutes between each measurement. To reduce the influence of the white-coat effect - defined as a persistently increased blood pressure at the medical office, compared with measurements at home or after 24-hour ambulatory blood pressure monitoring (ABPM) - on BP values, the measurements were taken at the patients' homes[12,13].

Adherence was measured using the eight-item Morisky Medication Adherence Scale (MMAS-8)[6], translated into Brazilian Portuguese (chart 1) and validated for the present study. To obtain conceptual equivalence, the MMAS-8 was translated in accordance with the recommendations for translation and cultural adaptation of Beaton et al.[14], Wild et al.[15], which require the translation and back-translation by bilingual translators, some of which are independent. After evaluation and approval by the author of the scale, the translated version was tested in a group of 20 patients with hypertension to check for understanding of the questions in accordance with its original meaning. The questions were understood identically by all, and subsequent alterations were not considered necessary.

The MMAS-8, an update with greater sensitivity of the four-item scale published in 1986 and considered the most commonly used self-reporting method to determine adherence, contains eight questions with closed dichotomous (yes / no) answers, designed to prevent the bias of positive responses from patients questions asked by health professionals, by reversing the responses related to the interviewee's adherence behavior[6,16]. Thus, each item measured a specific adherence behavior, with seven questions that must be answered negatively and only one positively, with the last question being answered according to a scale of five options: never, almost never, sometimes, often, and always.

The degree of adherence was determined according to the score resulting from the sum of all the correct answers: high adherence (eight points), average adherence (6 to < 8 points) and poor adherence (< 6 points)[17]. In this study, patients were considered adherent when they had a score equal to eight in the MMAS-8.

To assess the internal consistency, we used the item-total correlation and Cronbach's alpha.

Sample size

Considering the original study by Morisky et al., where 16% of patients achieved a score of 8 at the MMAS-8, as well as absolute accuracy of 5% and confidence interval of 95%, a sample of 207 individuals was determined. In order to correct any losses and provide a better breakdown of the independent variables, the sample size was adjusted by a proportional factor of 1.25. Thus, the sample size for this study was established at 230 patients. The number of patients needed to assess the internal consistency was considerably lower, being obtained by Non-Parametric Approach to Calculate Sample Size Based on Assessment Questionnaires or Scales in Healthcare Area, developed by Couto Jr.[18], which estimates the sample size by the number of items and categories of the data collection instrument.

Statistical Analysis

Data analysis was performed using SPSS software, release 12. Statistical analyzes involved: descriptive analyzes, the Kolmogorov-Smirnov test to check the normality of continuous variables, chi-square and Kruskal-Wallis test to test the relationship between adherence and other independent variables, and binary logistic regression. All variables with $p < 0.25$ in the bivariate analysis were included in the initial model of the multivariate analysis. Then the variables that showed a higher value of p were removed, one by one, until only variables with statistical significance remained in at least one of the categories of therapeutic adherence. The level significance was set at $\alpha < 5\%$.

Ethical Aspects

The study was approved by the Ethics Committee in Research of Universidade Federal de Alagoas on 11/06/2009, protocol# 010186/2009-01. Data were collected only after the informed consent had been signed by all patients.

Chart 1

1. Do you sometimes forget to take your high blood pressure pills?	Yes / No
2. Over the past two weeks, were there any days when you did not take your high blood pressure medicine?	Yes / No
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	Yes / No
4. When you travel or leave home, do you sometimes forget to bring along your medications?	Yes / No
5. Did you take your high blood pressure medicine yesterday?	No / Yes
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medicine?	Yes / No
7. Do you ever feel hassled about sticking to your blood pressure treatment plan?	Yes / No
8. How often do you have difficulty remembering to take all your blood pressure medication?	Never/ Almost Never/ Sometimes/ Quite Often/ Always

Results

We selected 231 patients, eight of whom declined to participate in the study (refusal rate = 3.5%). The mean age of patients was 57.18 years (± 12.7), with a minimum age of 27 and maximum of 85 years, and the majority (70.9%) of them were females. Only 46 (20.6%) patients practiced some regular physical activity. Smoking and alcohol consumption were reported by 10.3% and 18.8% of patients, respectively. None of the variables investigated was associated with adherence or blood pressure control (Tables 1 and 2).

Therapeutic adherence and blood pressure control

Only 34.1% of patients had blood pressure under control. The rate of therapeutic adherence (MMAS-8 = 8, high adherence) was 19.7%. The mean adherence value according to the MMAS-8 was 5.8 (± 1.8). Among patients considered non-adherent, 33.2% had mean adherence, and 47.1%, low adherence. According to logistic regression analysis, patients who reached maximum values in the MMAS-8 showed to be more likely (OR = 6.1, [95%] CI = 3.0 to 12.0) to have blood pressure control than those who attained mean (6 to <8) or low (<6) values. The association of BP control (p = 0.000) and mean SBP and DBP (p = 0.002510 and p = 0.000135, respectively) with the degree of adherence can be seen in Table 3.

Additionally, these associations can be used to investigate a suspected sub-optimal adherence to therapy in patients with uncontrolled BP: 75.6% of patients with uncontrolled BP did not adhere to antihypertensive treatment, while 33.3% of patients with BP under control were nonadherent.

Medication use

The mean number of drugs prescribed per patient was 3.15 (± 1.63, 3.11 among adherent, and 3.16 among non-adherent patients) and the mean number of antihypertensive drugs per patient was 1.61 (± 0.65; 1.51 and 1.67 in adherents and non-adherents, respectively). The most frequently prescribed medications were hydrochlorothiazide (to 53.3% of patients), captopril (49.9%), propranolol (14.3%), enalapril (12.1%), amlodipine (11.2%), atenolol (8.5%) and losartan (4.9%). Most patients (52.5%) had been using the same anti-hypertensive drug therapy for five years or more, 20.2% had used the same treatment for three or four years, 12.6% had used it for one to two years; 8 5% from six months to a year, and 6.3%, for less than six months.

Antihypertensive monotherapy was prescribed to 47.1% of patients; 45.3% were taking two antihypertensive drugs and 7.1% were using three or more drugs, one of which was a diuretic. While 36.2% of patients on monotherapy and 36.6% of patients taking two drugs had controlled blood pressure (Table 2), only 5.9% of patients using three or more antihypertensive drugs had the same outcome (p = 0.038).

Among patients with uncontrolled blood pressure, 2.7% (1.8% of total patients) were both adherents and users of triple antihypertensive therapy containing a diuretic, characterizing resistant hypertension. The other patients who had elevated BP values were divided as follows: 8.2% did not adhere to triple therapy with a diuretic, 8.8% were adherent, but used one or two antihypertensive drugs, and 80.3 % were nonadherent and used one or two antihypertensive drugs (Table 4).

Scale reliability

The corrected item-total correlation resulted in a value < 0.20 for item 3, which was low, although significantly different from zero. However, the Cronbach's alpha values resulting from the exclusion of each item were lower, without exception, than the resulting coefficient (α = 0.69), indicating that the inclusion of item 3 did not affect the instrument reliability (Table 5).

Discussion

Cardiovascular Diseases (CVD), of which main risk factor is hypertension[19,20], are a major cause of mortality both worldwide and in Brazil, where they accounted for 32% of deaths in individuals over 30 years in 2005[21]. Several BP control measures have been tested[22,23]; however, not even the strong evidence that several antihypertensive drug treatments are effective in reducing cardiovascular morbidity and mortality rates mean appropriate blood pressure (BP) control, due to poor adherence to treatment[9,24]. Studies of the Brazilian population indicate a BP control of 20% to 60%[20,25-27], within the same range of BP control observed in our study.

According to literature, poor adherence affects the clinical outcome and quality of life, causing adverse outcomes such as increased morbimortality and healthcare costs[28]. In the treatment of hypertension, its first consequence is the failure in BP control; several studies have shown this association, also found in our study, in which significantly lower systolic and diastolic pressures were observed among patients with a high degree of adherence[6,29,30].

The dichotomous categorization of adherence in adherent vs. nonadherent patients was based, as in the original study,

Table 1 – Therapy adherence, sociodemographic characteristics and life habits of hypertensive patients, Maceió, AL, 2011

Variable	Adherent		Non-adherent	
	n	(%)	n	(%)
Age				
18-29	0	0	2	100
30-39	4	17.4	19	82.6
40-49	8	27.6	21	72.4
50-59	11	18.6	48	81.4
60-69	20	28.2	51	71.8
≥ 70 or older	8	21.6	29	78.4
Gender				
Female	37	23.4	121	76.6
Male	14	21.5	51	78.5
Number of drugs				
1	7	25.9	20	74.1
2-3	23	20.7	88	79.3
4-5	17	28.8	42	71.2
≥ 6	4	20.0	22	80.0
Number of anti-hypertensive drugs				
1	24	22.9	81	77.1
2	23	22.8	78	77.2
3	4	28.6	10	71.4
≥ 4	-	-	3	100.0
Time of anti-hypertensive treatment				
< 1 year	9	27.3	24	72.7
1 a 2 years	9	32.1	19	67.9
2 a 4 years	6	13.3	39	86.7
≥ 5 years	27	23.1	90	76.9
Level of Schooling				
Illiterate	27	21.4	99	78.6
Elementary School	12	21.4	44	78.6
High School	12	32.4	25	67.6
College or University	0	0	3	100
Physical Activity				
Yes	15	32.6	31	67.4
No	36	20.5	140	79.5
Smoker				
Yes	5	21.7	18	78.3
No	46	23.0	154	77.0
Regular alcohol consumption				
Yes	5	12.2	36	87.8
No	38	21.3	140	78.7
Controlled BP*				
Yes	34	44.7	42	55.3
No	17	11.6	130	88.4

** p = 0.000; Pearson's Chi-square.*

Table 2 – Blood pressure control, sociodemographic characteristics and life habits of hypertensive patients, Maceió, AL, 2011

Variable	Controlled BP		Uncontrolled BP	
	n	(%)	n	(%)
Age (yrs.)				
18-29	0	0	4	100
30-39	6	26.1	17	73.9
40-49	6	20.7	23	79.3
50-59	26	44.1	33	55.9
60-69	25	35.2	46	64.8
≥ 70	13	35.1	24	64.9
Gender				
Female	53	30.3	105	69.7
Male	23	28.6	42	71.4
Number of medications*				
1	10	37.0	17	63.0
2-3	39	35.1	72	64.9
4-5	19	42.4	40	57.6
≥ 6	8	26.7	22	73.3
Number of anti-hypertensive drugs				
1	38	36.2	67	63.8
2	37	36.6	64	63.4
3	1	7.1	13	92.9
≥ 4	-	-	3	100.0
Time of anti-hypertensive treatment				
<1 year	12	36.4	21	63.6
1 to 2 years	10	39.3	17	60.7
2 to 4 years	18	40.0	37	60.0
≥ 5 years	35	29.9	82	70.1
Level of schooling				
Illiterate	40	31.7	86	68.3
Elementary School	21	58.3	35	41.7
High School	15	40.5	22	59.5
College or University	0	0	3	100
Physical activity				
Yes	19	41.3	27	58.7
No	57	32.4	119	67.6
Smoker				
Yes	7	30.4	16	69.6
No	69	34.5	131	65.5
Regular alcohol consumption				
Yes	12	29.2	29	70.8
No	62	34.8	116	65.2

** p = 0.038; Pearson's Chi-square.*

Table 3 – Association between the degrees of therapy adherence with BP control and mean BP values, Maceió, AL, 2011

	Blood Pressure Control *		Mean Blood Pressure Values	
	Yes	No	SBP†	DBP‡
	%	%	mmHg (DP)	F (%)
Low adherence (<6)	19.4	80.6	135.7 (16.21)	95.3 (13.75)
Middle adherence (6 a <8)	37.0	63.0	133.0 (16.24)	92.2 (12.44)
High adherence (8)	65.1	34.9	125.5 (11.99)	85.3 (11.25)

BP control: systolic BP < 140 mmHg, diastolic BP < 90 mmHg
**(p = 0.000); Chi-square.*
† systolic BP (p = 0.002510); Kruskal-Wallis.
‡ diastolic BP (p = 0.000135); Kruskal-Wallis.

Table 4 – Corrected item-total correlation and tool reliability

Item	Corrected item-total correlation	Cronbach's Alpha if the item is excluded
1. Do you sometimes forget to take your high blood pressure pills?	0,615	0,558
2. Over the past two weeks, were there any days when you did not take your high blood pressure medicine?	0,482	0,589
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	0,189	0,652
4. When you travel or leave home, do you sometimes forget to bring along your medications?	0,236	0,645
5. Did you take your high blood pressure medicine yesterday?	0,353	0,626
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medicine?	0,405	0,614
7. Do you ever feel hassled about sticking to your blood pressure treatment plan?	0,234	0,645
8. How often do you have difficulty remembering to take all your blood pressure medication?	0,497	0,628

α = 0,689

Table 5 – Anti-hypertensive drug therapy and treatment adherence of patients with uncontrolled BP (resistant and pseudoresistant hypertension), Maceió, AL, 2011

Drug therapy	Adherent		Adherent		Total	
	n	(%)	n	(%)		
Monotherapy or double therapy	13†	8,8	118†	80,3	131	89,1
Triple therapy with one diuretic agent	4*	2,7	12†	8,2	16	10,9

**Resistant hypertension*
†Pseudoresistant hypertension

on the association between the scale and blood pressure control. However, in this study, only those patients with high adherence (score of 8) were considered adherent, as this group was associated with blood pressure control (Table 3). In a study by Morisky et al.[6] patients with high and medium adherence were considered adherent.

Although the application protocols are identical, the results suggest that the interpretation of the score is different, making the care target to be focused on improving adherence behavior not only in patients with a low level of adherence, but also those with a medium degree. In our study, 65.1% of patients with high adherence and 37.0% of patients with medium degree of adherence had controlled BP, while in the original study the difference between both groups was lower (56.7% and 44.8%, respectively). However, both studies showed a lower percentage of patients with a high degree of adherence, less than 20%.

Initially, the use of the first Morisky adherence scale (MMAS-4) allowed not only to determine non-adherent patients at risk of not achieving BP control, but also to know some causes of poor adherence. As new self-reporting methods were developed, its use as a screening tool in clinical practice has become an increasingly desirable characteristic. In the treatment of patients with uncontrolled hypertension, for instance, the investigation of the probable causes should always consider the non-adherence. In our study, the translated version of MMAS-8 identified a large proportion of non-adherent patients among those with uncontrolled blood pressure, more than two-fold the number of patients with BP under control.

According to the World Health Organization, 51% of patients with hypertension in the United States adhere to treatment, while in China, the rate of adherence among these patients is 43%[3]. Hyre et al.[29], in a study with MMAS-8 applied to patients with hypertension, found that 35.6% of patients adhered completely to the prescription. However, in such studies, the cost of drugs was a factor that hindered patient adherence, whereas the patients included in this study had free access to anti-hypertensive drugs. The cost of drugs is the most widely studied[8,31] predictive factor of nonadherence, and its importance in the compliance to antihypertensive treatments have been demonstrated in studies involving large numbers of patients[32,33]. Nevertheless, the rate of adherents observed in the current investigation was lower than that in the aforementioned studies, indicating that free access to antihypertensive treatment itself did not lead to satisfactory levels of adherence.

According to two major studies reviewing therapeutic adherence, one of which covers fifty years of research on the topic, adherence has no apparent association with demographic characteristics - such as gender, age, socioeconomic status and ethnic group - and disease severity[2,31]. Some predictors, however, have been consistently associated with poor adherence, among which we highlight the complexity of the regimen, the treatment of asymptomatic disease, the presence of psychological problems like depression and medication side effects[34]. Except for the psychological problems, which were not considered in our study, other factors had little or no influence on the adherent behavior of the studied patients. The most relevant component of the therapeutic regimen complexity is the number of prescribed drugs[34]. However, no association was found between the number of drugs used and their dosage, and treatment adherence.

As for the predictors of BP control, recently, the ALLHAT study[35] - a randomized clinical trial involving a large number of patients aimed to assess the control of hypertension and the effects of antihypertensive drugs on clinical outcomes - identified higher basal BP, Black ethnicity and age as the main predictors of lack of BP control. Among the additional causes are the female gender, diagnosis of diabetes, obesity, previous antihypertensive therapy and left ventricular hypertrophy[35]. Of all these factors, only age, gender, use of oral hypoglycemic agents and duration of antihypertensive treatment were considered in this investigation. Nevertheless, the only variable related to poor BP control, as well as non-adherence, was the use of three or more antihypertensive agents.

One hypothesis for this finding is that even among patients considered adherent by the MMAS-8, there may be incorrect drug use. The translated and validated adherence scale used in this study, although it contains several questions related to specific non-adherent behavior, does not address issues such as time and method of using, which may explain the lack of association between the use of three or more antihypertensive drugs with an inadequate adherence, but the existence of an association between the number of these drugs and lack of BP control. Another hypothesis is the highest degree of severity of these patients' clinical condition, implying greater difficulty in controlling BP. Moreover, factors such as the quality of pharmacotherapy practiced within the Public Health System should be investigated for the accurate identification of the relevant causes of uncontrolled hypertension.

In clinical practice, patients adherent and non-responsive to the triple optimized antihypertensive therapy that includes a diuretic agent characterize cases of resistant hypertension[9-11]. According to this concept, 1.8% of the interviewed patients had resistant hypertension. The prevalence of resistant hypertension, which is generally not known, has recently been estimated in the United States, representing approximately 8.9 % of hypertensive patients[36]. In this situation it is necessary to evaluate the presence of factors that hinder BP control, such as excessive sodium intake, alcohol consumption, obesity, use of drugs with potential to raise blood pressure, obstructive sleep apnea syndrome and secondary forms of hypertension, and correct these factors[9].

In turn, the term "pseudoresistant hypertension" refers to the lack of BP control in patients with appropriate treatment exposed to other factors that contribute to raise BP measurements, such as inappropriate measurement technique, white-coat effect and *low adherence*[10,11]. The choice of the active ingredients or dose, the first of the

causes of pseudoresistant hypertension was not analyzed individually in our study, but considered in accordance with the antihypertensive and dose ranges contained in the National List of Essential Medications (Rename)[37]. Thus, no therapeutic choice was considered inappropriate. Therefore, all patients with uncontrolled BP who did not have resistant hypertension were classified as having pseudoresistant hypertension, found in 64.1% of the patients. Pseudoresistant hypertension caused by poor adherence accounted for 58.3% of patients in the study. It is important to consider that this value could be even higher, as the self-reporting methods have as major limitation the underestimation of the number of non-adherent individuals.

In turn, the self-reporting methods to determine adherence, in contrast with techniques such as quantification of drugs and their metabolites in body fluids, drug electronic monitoring (Medication Event Monitoring System - MEMS) or counting the pills unused by the patient, are simple, rapid, noninvasive, and economical, and can provide a real-time opinion about the adherence behavior of patients and potential reasons for non-adherence[38].

Although these methods are subject to bias, as the overestimation of adherence, the constant improvement of these instruments and their validation studies in different populations have increased their adoption in clinical practice[6].

The internal consistency measured by Cronbach's alpha (0.69) was lower than that obtained by Morisky et al.[6] in patients with hypertension (0.83), but slightly higher than the internal consistency values observed in studies with scale translation into other languages published so far[39]. According to Añez et al.[40], an alpha value > 0.5 have been considered acceptable in questionnaire validation studies, a value which was adopted by Al-Qazaz in a cross-cultural adaptation study of the MMAS-8 into Malaysian[39]. Although a number of questions showed a lower item-total correlation, as is the case of questions 3, 4 and 7, it was observed that the removal of these questions would not increase the instrument's alpha, which would make the exclusion unjustified, de-characterizing the instrument.

In the present study, MMAS-8 showed good potential as a screening tool in clinical practice to identify non-adherent patients and those at risk of uncontrolled BP, considering the reliability of the translated version, its significance association with the BP control and the SBP and DBP values, its simplicity and validation in other studies with hypertensive patients. In the SUS context, this scale can be an important tool for hypertension control. Another broader investigation to determine adherence in patients using antihypertensive drugs supplied free of cost by the government is being carried out.

Limitations

In this study, some predictors of non-adherence - such as depression - and of absence of blood pressure control - such as ethnicity and higher basal levels of systolic and diastolic BP - were not investigated as variables of interest or even considered in the process of patient inclusion. The classification of patients with uncontrolled hypertension according to the pseudo-resistant hypertension type is also subject to interpretation bias, since despite the careful observation of other causal factors of pseudo-resistant hypertension, and efforts to reduce or control some of them, such as white-coat effect and inadequate measure of blood pressure, the only cause that can be determined with precision was therapy adherence.

Final Considerations

The diagnosis of non-adherent behavior through the use of the new 8-item Morisky Medication Adherence Scale (MMAS-8) in patients treated with antihypertensive drugs was a predictive factor of elevated systolic and diastolic blood pressure. Considering that non-adherence is a major cause of uncontrolled blood pressure, the use of self-report scales related to BP is a simple and inexpensive measure to assist the clinical treatment of patients with hypertension.

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Potential Conflict of Interest

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

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References

1. Munger MA, Van Tassell BW, LaFleur J. Medication nonadherence: an unrecognized cardiovascular risk factor. MedGenMed. 2007;9(3):58.
2. DiMatteo MR. Variations in patients' adherence to medical recommendations: a quantitative review of 50 years of research. Med Care. 2004;42(3):200-9.
3. World Health Organization (WHO). Adherence to long-term therapies: evidence for action. Geneva(Switzerland); 2003.
4. Carneiro Junior N, de Jesus CH, Crevelim MA. A Estratégia Saúde da Família para a equidade de acesso dirigida à população em situação de rua em grandes centros urbanos. Saude Soc São Paulo. 2010;19(3):709-16.
5. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care. 1986;24(1):67-74.
6. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens (Greenwich). 2008; 10(5):348-54.
7. Obreli-Neto PR, Prado MF, Vieira JC, Fachini FC, Pelloso SM, Marcon SS, et al. Fatores interferentes na taxa de adesão à farmacoterapia em idosos atendidos na rede pública de saúde do Município de Salto Grande – SP, Brasil. Rev Cienc Farm Basica Apl. 2010;31(3):229-33.
8. Piette JD, Rosland AM, Silveira MJ, Hayward R, McHorney CA. Medication cost problems among chronically ill adults in the US: did the financial crisis make a bad situation even worse? Patient Prefer Adherence. 2011;5:187-94.
9. Sociedade Brasileira de Cardiologia / Sociedade Brasileira de Hipertensão / Sociedade Brasileira de Nefrologia. VI Diretrizes Brasileiras de Hipertensão. Arq Bras Cardiol. 2010;95(1 supl.1):1-51.
10. Pimenta E, Calhoun DA, Oparil S. Mechanisms and treatment of resistant hypertension. Arq Bras Cardiol. 2007;88(6):683-92.
11. Sarafidis PA, Bakris GL. Resistant hypertension: an overview of evaluation and treatment. J Am Coll Cardiol. 2008;52(22):1749-57.
12. Spence JD. White-coat hypertension is hypertension. Hypertension. 2008;51(5):1272.
13. Brown MA, Buddle ML, Martin A. Is resistant hypertension really resistant? Am J Hypertens. 2001;14(12):1263-9.
14. Beaton D, Bombardier C, Guillemin F, Ferraz MB. Recommendations for the cross-cultural adaptation of health status measures. Rosemont(Illinois): American Academy of Osthopaedic Surgeons/ Institute for Work &Health; 2002.
15. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. ISPOR Task Force for Translation and Cultural Adaptation. Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. Value Health. 2005;8(2):94-104.
16. Voils CI, Hoyle RH, Thorpe CT, Maciejewski ML, Yancy WS Jr. Improving the measurement of self-reported medication nonadherence. J Clin Epidemiol. 2011;64(3):250-4.
17. Krousel-Wood M, Islam T, Webber LS, Re RN, Morisky DE, Muntner P. New medication adherence scale versus pharmacy fill rates in seniors with hypertension. Am J Manag Care. 2009;15(1):59-66.
18. Couto Jr EB. Abordagem não-paramétrica para cálculo do tamanho de amostra com base em questionários ou escalas de avaliação na área de saúde [tese]. São Paulo: Universidade de São Paulo; 2009.
19. Cesarino CB, Cipullo JP, Martin JF, Ciorlia LA, Godoy MR, Cordeiro JA, et al. Prevalência e fatores sociodemográficos em hipertensos de São José do Rio Preto. Arq Bras Cardiol. 2008;91(1):29-35.
20. Rosário TM, Scala LC, França GV, Pereira MR, Jardim PC. Prevalência, controle e tratamento da hipertensão arterial sistêmica em Nobres, MT. Arq Bras Cardiol. 2009;93(6):672-8.
21. Taylor J. Cardiology in Brazil: a country in development. Eur Heart J. 2010;31(13):1541-2.
22. Curioni C, Cunha CB, Veras RP, André C. The decline in mortality from circulatory diseases in Brazil. Rev Panam Salud Publica. 2009;25(1):9-15.
23. Cesse EAP, Carvalho EF, Souza WV, Luna CF. Tendência da mortalidade por doenças do aparelho circulatório no Brasil: 1950 a 2000. Arq Bras Cardiol. 2009;93(5):490-7.
24. Wright JM, Musini VM. First-line drugs for hypertension. Cochrane Database Syst Rev. 2009 Jul 8;(3):CD001841.
25. Strelec MA, Pierin AM, Mion D Jr. A influência do conhecimento sobre a doenças e atitude frente a tomada dos remédios no controle da hipertensão arterial. Arq Bras Cardiol. 2003;81(4):349-54.
26. Moreira GC, Cipullo JP, Martin JF, Ciorlia LA, Godoy MR, Cesarino CB, et al. Evaluation of the awareness, control and cost-effectiveness of hypertension treatment in a Brazilian city: populational study. J Hypertens. 2009;27(9):1900-7.
27. Nogueira D, Faerstein E, Coeli CM, Chor D, Lopes C de S, Werneck GL. [Awareness, treatment, and control of arterial hypertension: Pró-Saúde study, Brazil]. Rev Panam Salud Publica. 2010;27(2):103-9.
28. Pittman DG, Tao Z, Chen W, Stettin GD. Antihypertensive medication adherence and subsequent healthcare utilization and costs. Am J Manag Care. 2010;16(8):568-76.
29. Hyre AD, Krousel-Wood MA, Muntner P, Kawasaki L, DeSalvo KB. Prevalence and predictors of poor antihypertensive medication adherence in an urban health clinic setting. J Clin Hypertens (Greenwich). 2007;9(3):179-86.
30. Morgado M, Rolo S, Macedo AF, Pereira L, Castelo-Branco M. Predictors of uncontrolled hypertension and antihypertensive medication nonadherence. J Cardiovasc Dis Res. 2010;1(4):196-202.
31. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med. 2005;353(5):487-97.
32. Taira DA, Wong KS, Frech-Tamas F, Chung RS. Copayment level and compliance with antihypertensive medication: analysis and policy implications for managed care. Am J Manag Care. 2006;12(11):678-83.
33. Maciejewski ML, Bryson CL, Perkins M, Blough DK, Cunningham FE, Fortney JC, et al. Increasing copayments and adherence to diabetes, hypertension, and hyperlipidemic medications. Am J Manag Care. 2010;16(1):e20-34.
34. George J, Phun YT, Bailey MJ, Kong DC, Stewart K. Development and validation of the medication regimen complexity index. Ann Pharmacother. 2004;38(9):1369-76.
35. Cushman WC, Ford CE, Cutler JA, Margolis KL, Davis BR, Grimm RH, et al; ALLHAT Collaborative Research Group. Success and predictors of blood pressure control in diverse North American settings: the antihypertensive and lipid-lowering treatment to prevent heart attack trial (ALLHAT). J Clin Hypertens (Greenwich). 2002;4(6):393-404.
36. Persell SD. Prevalence of resistant hypertension in the United States, 2003-2008. Hypertension. 2011;57(6):1076-80.
37. Ministério da Saúde. Secretaria de Ciência, Tecnologia e Insumos Estratégicos. Departamento de Assistência Farmacêutica e Insumos Estratégicos. Relação nacional de medicamentos essenciais: Rename . 7ª.ed. Brasilia; 2010. (Série B. Textos Básicos de Saúde).
38. Zeller A, Ramseier E, Teagtmeyer A, Battegay E. Patients' self-reported adherence to cardiovascular medication using electronic monitors as comparators. Hypertens Res. 2008;31(11):2037-43.
39. Al-Qazaz HKh, Hassali MA, Shafie AA, Sulaiman SA, Sundram S, Morisky DE. The eight-item Morisky Medication Adherence Scale MMAS: translation and validation of the Malaysian version. Diabetes Res Clin Pract. 2010 Nov;90(2):216-21.
40. Añez CRR, Reis RS, Petroski EL. Versão brasileira do questionário "estilo de vida fantástico": tradução e validação para adultos jovens. Arq Bras Cardiol. 2008;91(2):102-9.