Treatment Adherence and Blood Pressure Control in Older Individuals with Hypertension

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Abstract

Background: Non-adherence to treatment has been identified as the main cause of uncontrolled blood pressure (BP), and may rep-resent a greater risk in older individuals.

Objective: The aim of this study was to evaluate and compare the rate of adherence to hypertension treatment using different methods, to estimate the BP control rate, and to observe if there is an association between BP control and adherence.

Methods: Treatment adherence was evaluated in older patients with hypertension, followed by the public primary health care, through four methods, including the Morisky-Green test (reference), the Attitude regarding the Medication Intake questionnaire (AMI), an evaluation of adherence by the nurse in the office (Nurse Adherence Evaluation - NAE), and at home (Home Adherence Evaluation – HAE). Salt intake was estimated by 24-hour sodium urinary excretion. BP control was assessed by the awake ambulatory blood pressure monitoring.

Results: Concordance between the Morisky-Green test and AMI (Kappa=0.27) or NAE (Kappa=0.05) was poor. There was a moderate concordance between the Morisky-Green test and HAE. Eighty percent had controlled BP, including 42% with white-coat effect. The group with lower salt excretion informed to avoid salt intake more times (p<0.001) and had better medication adherence (p<0.001) than the higher salt excretion group.

Conclusion: The evaluated tests did not show a good concordance to the Morisky-Green test. Adherence to hypertension treatment was low; however, there was a high rate of BP control when subjects with the white-coat effect were included in the analysis. (Arq Bras Cardiol 2012;99(1):636-641)

Keywords: Hypertension / prevention & control; medication adherence; blood pressure; aged.

Introduction

The prevalence of hypertension in older subjects is higher than 60% and the correct diagnosis and unremitting patients' follow-up are very important keys to achieve the ideal goal of treatment and reduce cardiovascular morbidity and mortality.

Adherence to treatment, defined as the correct following of the physician's prescription,[1] including medications and/or changes in life style, is a significant factor of the treatment success. Non-adherence has been identified as the main cause of uncontrolled blood pressure (BP)[2], thus representing a meaningful risk to cardiovascular events. The correct intake of at least 80% of prescribed medications it is a general way to consider adequate drug adherence[2]. The estimated adherence to medications is around 50%[3], and this rate decreases even further regarding life style changes[4].

Evaluation of adherence is not standardized, turning into a hard task any comparisons. Direct methods as biological assays, or directly observed therapy (DOT) are difficult to apply, expensive, and not exempted of errors[5]. Among indirect methods, the Morisky-Green test is a simple validated instrument to estimate adherence to the treatment[6]. It comprises four questions to be answered with 'yes' or 'no' and, although it is not an ideal method, it has been the most used one in previous studies about adherence to the treatment of chronic diseases and can be accepted as a reference test. The original study showed that seventy-five percent of the hypertensive patients who scored high on the four-item scale after two years of follow up had their blood pressure under adequate control at year 5, compared with 47% under control at year 5 for those patients scoring low (P less than 0.01)[6].

The aims of this study were to evaluate and compare adherence rates to the treatment of hypertension of older patients in primary health care using the Morisky-Green test and three non-validated indirect methods; to estimate the rate of BP control; and to observe if there is an association between BP control and adherence.

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Methods

Sixty older patients (60 years-old or more) followed by the public primary health care, who filled all inclusion criteria, were invited to participate: one to eight years of formal education, hypertension in regular treatment, no evidence of secondary hypertension, in use of more than four medications per day, no use of medications that could interfere on BP control, no cognitive deficits (Mini-Mental State Examination with score higher than 24 points)[7] and independents (Barthel Index with score of 20 points)[8]. This study was performed in accordance with the Declaration of Helsinki (1989) and approved by the local Human Research Ethics Committee. Informed consent was obtained from each volunteer.

An oral questionnaire was applied by a trained nurse to collect information about the duration of disease, number of medications in use, knowledge about hypertension risks, difficulties to obtain the medications, problems to take them in a regular way, including side effects and the prescription perception. Alcohol consumption, cigarette smoking, salt intake, and physical activity were also evaluated.

BP was measured three times in the office by a trained nurse, in the seated position[9]. After one week, this procedure was repeated. Volunteers were also submitted to one ambulatory blood pressure monitoring (ABPM, Spacelabs 90207, Redmond, Washington, USA) and were considered controlled when the mean BP, during the period of awake, was lower than 135/85 mmHg[10]. When awake ABPM was controlled and Office BP was equal or higher 140x90 mmHg, the patient was classified as having the white coat effect. When the Office BP was lower than 140x90 mmHg and awake ABPM was equal or higher 135/85 mmH, the patient was classified as having false control.

A 12-hour fasting blood sample was drawn for the determination of plasma glucose, total cholesterol, HDL-cholesterol, triglycerides, creatinine, and potassium concentrations.

Thirty-three patients were randomly assigned to perform the adherence tests:

1. Morisky-Green test:[6] it comprises four yes/no questions: (1) Have you ever forgotten to take your medicine? (2) At times, are you not careful about taking your medicine? (3) When you feel better, do you sometimes stop taking your medicine? (4) At times, if you feel worse when you take your medicine, do you stop taking them? A person was considered to be non-adherent whether he/she responded affirmatively to at least one question. 2. Attitude regarding the Medication Intake questionnaire (AMI). 3. Nurse Adherence Evaluation (NAE): evaluation of adherence by the nurse in the office. 4. Home Adherence Evaluation (HAE): adherence to the treatment was estimated by the availability of medications for hypertension and by the information given by the patient simulating the intake of them. BP was measured three times by the nurse (Home BP). The patient was considered adherent by the last three tests if had a correct intake of 80% or more of the total hypertension medications.

Two 24-hour urine specimens were collected for urinary sodium excretion (UNaV) determination, and the mean excretion was considered an estimate of the amount of sodium intake.

BP means obtained were compared through a unified approach to mixed linear models[11]. The Fisher's exact test was used to compare qualitative data between groups. The Kappa Index was applied to evaluate the degree of concordance[12]. The following categorization was adopted: less than zero: *poor*; 0.00-0.20: *slight*; 0.21-0.40: *fair*; 0.41-0.60: *moderate*; 0.61-0.80: *substantial*; and 0.81-1.00: *almost perfect*. Statistical analysis: performed by the employment of the SAS/STAT® software, Version 9, Cary, NC, USA: SAS Institute Inc., 2002-2003. The adopted level of significance was $p < 0.05$. Data are expressed as mean ± standard deviation.

Results

The mean age was 71±6 years, with 3.7±1.8 years of formal education, 63% female, 60% white, 63% married, 68% retired, 65% living with a partner, 60% with familiar income from US$ 175.00 to US$ 524.00, with 1.8±1.2 dependents. Thirty-three percent had diabetes, 42% hyperlipidemia, and 10% both. All volunteers had normal values of plasma creatinine and potassium. The mean BMI was 26.4±3.9 Kg/m², 17% with degree I obesity.

Eighty-eight percent were conscious of the hypertension diagnosis, and 72% informed to know the duration of their disease (mean of 11.6±8.2 years). Twenty percent did not know that hypertension increases the risk to cardiovascular morbidity and mortality, and 42% believed in the cure of essential hypertension.

The patients reported an intake of 4.5±2.3 medications/day. However, there were 6.1±2.0 prescribed drugs ($p < 0.001$). Considering only anti-hypertensive medications, the numbers were 1.2±0.8 and 1.9±0.4, respectively ($p < 0.001$). Fifty-eight percent of the subjects mentioned medication interruption because of adverse effects and 40% had adverse effects associated to the medications at that moment. Forty-eight percent informed that frequently forgot one of the prescribed medications.

Patients with controlled BP knew the time of hypertension diagnosis more frequently than uncontrolled ones (75% vs. 42%, p=0.04).

Regarding the prescription, 78% of the volunteers reported they did not understand the physician handwriting. Problems to obtain the medications were rarely described. Two subjects were in use of tobacco, and 11% in alcohol intake (750 ml of beer per week). Regular physical activity was reported by 43%, mainly walking and gym, although 90% mentioned previous physician advice about the importance of exercises. Fifty percent commented that they avoided salt and 42%, fat food.

The results of all BP measuring are showed in Table 1, with lower BP obtained by awake ABPM than by the nurse ($p < 0.05$). Forty-two percent of the patients had the white-coat effect, 7% had a false control, 13% were not controlled, and 38% had controlled hypertension. Considering the last group and patients with the white coat effect together, the rate of BP control was 80%.

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Table 1 - BP of older individuals at the first (Office BP1) and at the second (Office BP2) nurse evaluation, the mean of them, the BP measured by ambulatory blood pressure monitoring during awake period (Awake ABPM), and BP obtained by nurse at home (Home BP) (mean±SD)

		SBP (mmHg)	DBP (mmHg)
Office BP1	(n=60)	144 ± 22	82 ± 12
Office BP2	(n=60)	139 ± 23	81 ± 13
Mean Office BP	(n=60)	142 ± 22	82 ± 12
Awake ABPM	(n=60)	126 ± 15*	72 ± 10*

*$p<0.05$ vs. Office BP1, Office BP2, Mean Office BP and Home BP (Mixed linear models).

There were no differences in BP control between adherent and non-adherent patients, considering the results obtained by ABPM during the period of awake and the Morisky-Green test ($p=0.61$).

According to the Morisky-Green test, 36% of the subjects were adherent. However, 64% had positive attitudes regarding medications intake. In the HAE, 52% of them were in use of 80% or more of the anti-hypertensive drugs prescribed, similarly to the 55% found in the NAE.

The concordance between the Morisky-Green test and the AMI or the NAE was poor. There was a moderate concordance between the Morisky-Green test and the HAE (Table 2).

The mean 24-hour UNaV was 170±60 mmol/day. When patients that had a 24-hour UNaV equal or lower than 150 mmol/day and those with UNaV higher than 150 mmol/day were compared, the first group mentioned more times to avoid salt intake ($p<0.001$) and had better medication adherence evaluated by the Morisky-Green test ($p<0.001$) - Table 3. The urinary potassium excretion was 46±17 mmol/day.

Discussion

In this study, 42% of the studied older individuals were not conscious of the chronic characteristic of hypertension. Other study, evaluating adults in primary health services, found the percentage of 19% regarding this same issue[13]. This also found

that patients with controlled hypertension better knew the disease duration than uncontrolled ones.

Almost half of the subjects reported to forget the medications intake and had adverse effects. There were divergent numbers of medications mentioned by the patients and prescribed, considering all drugs and anti-hypertensive ones only. The higher the number of medications prescribed, the higher the risk of potential dangerous interactions and adverse effects, resulting in low adherence to the treatment[14]. Older patients have a mean number of around four to six medications in use[15]. This study selected patients with more than four medications, because this is the usually observed condition. One of the most important strategies to improve adherence in hypertension treatment is to simplify the treatment. Nevertheless, older patients have more chronic conditions, and many times, it is not possible to reduce the number of medications.

The majority of the patients were not able to read the physician prescription because of unclear handwriting. A prospective Brazilian study with 1,227 patients showed that all prescriptions were handwritten and that only 24% had legible names of medications, what could lead to serious intake mistakes[16]. Lower understanding of prescriptions was found among older patients and people with lower socioeconomic state. In developed countries older patients also had a greater prevalence of problems related to

Table 2 - Degree of concordance between the Morisky-Green test and three indirect methods: Attitude regarding the Medication Intake (AMI), Home Adherence Evaluation (HAE), and Nurse Adherence Evaluation (NAE), in hypertensive older individuals

	Morisky & Green Adherent Non-Adherent		Total	Kappa	IC 95%
AMI					
Positive attitude	10	11	21	0.27	(-0.01;0.54)
Negative attitude	2	10	12		
HAE					
Adherent	10	7	17	0.46	(0.17;0.75)
Non-Adherent	2	14	16		
NAE					
Adherent	7	11	18	0.05	(-0.26;0.37)
Non-Adherent	5	10	15		

Kappa coefficient - less than zero: poor; 0.00-0.20: slight; 0.21-0.40: fair; 0.41-0.60: moderate; 0.61-0.80: substantial; and 0.81-1.00: almost perfect.

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Table 3 - Distribution of hypertensive older individuals regarding the 24-hour urinary sodium excretion (UNaV), the reference of avoid salt intake or not, and the result of the Morisky-Green test

	UNaV≤150 mmol/day		UNaV >150 mmol/day		
Variable	N	%	N	%	pª
Avoid salt					
Yes	7	53.8%	7	35.0%	<0.001
No	6	46.2%	13	65.0%	
Morisky & Green					
Adherent	6	46.2%	6	30.0%	<0.001
Non-adherent	7	53.8%	14	70.0%	

ª Fischer's exact test

the form of prescriptions[17]. Electronic prescriptions can minimize risks.

In Brazil, the SUS (Unified Health System), the official public health provider, delivers basic hypertension drugs under no costs to the whole population. In this study the volunteers informed no difficulties in obtaining the prescribed medications.

There was not good concordance between the Morisky-Green test and the other ones applied. Similar discordance was referred by Solera et al, who found an adherence rate of 38% using a clinic interview and 91.1% with the Morisk-Greeen test in hypertensive patients with mean age of 66 ± 12[18]. The evaluation of adherence at home, where the nurse was able to check medications by herself, had better concordance with the Morisky-Green test than the AMI and the NAE, which are based only in patient information. Maybe it was the most reliable test applied in this study.

The low adherence obtained in this study can be explained by the selection of patients that were in use of more than four medications, had low income and adverse effects. Observational studies showed lower rates of adherence among older hypertensive patients than among younger ones[19]. Previous studies with older patients found 51%[20] and 23%[21] of adherence using the Morisky-Green test. On the other hand, the Morisky-Green test can overestimate poor adherence[22].

It was unexpected that, although the older individuals had a low adherence, they had a good BP control when evaluated by the ABPM. Older subjects had a high prevalence of the white coat effect, which can only be detected by methods with no health professional contact[23]. No association between the BP control and good adherence was found. It can be supposed that the subjects were in good control of BP with the intake of fewer medications than prescribed, maybe because the physicians were underestimating the BP control.

More than half of the subjects had no adherence to physical activity, even though the majority had received adequate advice about its importance. Physical activity helps to control cardiovascular risk factors and reduces BP independently of the weight loose effect[24].

The estimated sodium intake was higher than recommended[9]. Individuals with an intake of 150 mmol per day or less, that can be considered as on a normal sodium

diet, referred more times they avoided salt and had a higher rate of BP control than who had higher sodium intake. Salt restriction is very important to achieve BP control. There was an extra systolic BP decrease of 7.1 mmHg in normotensive people and 11.5 mmHg in hypertensive ones,[25] when it was associated to the DASH diet[26].

The estimated intake of potassium was adequate comparing to the INTERSALT Study[27]. One randomized double-blind study with 100 hypertensive older individuals concluded that a diet with lower salt and higher potassium and magnesium content promoted BP reduce[28]. Whelton et al[29] evaluated 975 older hypertensive patients and showed that the reduction of salt intake and body weight were effective and safety interventions.

Conclusions

This study showed that the three adherence tests evaluated have no good concordance to the validated Morisky-Green test. Adherence to the hypertension treatment was low in this old group followed in primary care; however, there was a good rate of BP control when subjects with the white-coat effect were detected by the ABPM.

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References

1. Car MR, Pierin AM, Aquino VL. [The influence of the education process on the control of arterial hypertension]. Rev Esc Enferm USP. 1991;25(3):259-69.

2. World Health Organization (WHO). Adherence to long-term therapies: evidence for action [internet]. [Cited on 2011 Jan 10]. Available from: http://www.who.int/chp/knowledge/publications/adherence_report/en/

3. Higgins N, Regan C. A systematic review of the effectiveness of interventions to help older people adhere to medication regimes. Age Ageing. 2004;33(3):224-9.

4. Serour M, Alghenaei H, Al-Sagabi S, Mustafa AR, Ben-Nakhi A. Cultural factors and patients' adherence to lifestyle measures. Br J Gen Pract. 2007;57(537):291-5.

5. Hamilton GA. Measuring adherence in a hypertension clinical trial. *Eur J Cardiovasc Nurs. 2003;2(3)*:219-28.

6. Morisky DE, Green LW, Levine DM. Concurrent and predictive of a self-reported measure of medication adherence. Med Care. 1986;24(1):67-74.

7. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": a practical method for grading the cognitive state for the clinician. J Psychiatr Res. 1975;12(3):189-98.

8. Granger CV, Albrecht GL, Hamilton BB. Outcome of comprehensive medical rehabilitation: measurement by PULSES profile and the Barthel Index. Arch Phys Med Rehab. 1979;60(4):145-54.

9. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. JAMA. 2003;289(19):2560-72.

10. Alessi A, Brandao AA, Pierin A, Feitosa AM, Machado CA, de Moraes Forjaz CL, et al / Sociedade Brasileira de Cardiologia. IV Diretriz para uso da monitorização ambulatorial da pressão arterial; II Diretriz para uso da monitorização residencial da pressão arterial. IV MAPA / II MRPA. Arq Bras Cardiol. 2005;85(supl. 2):1-18.

11. Landis RJ, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74.

12. Fleiss JL, Levin B, Paik MC. Statistical methods for rates and proportions. New York: John Wiley & Sons; 2003.

13. Lessa I, Fonseca J. Race, compliance to treatment and/or consultation and control of arterial hypertension. Arq Bras Cardiol. 1997;68(6):443-9.

14. de Lyra Júnior DP, do Amaral RT, Veiga EV, Cárnio EC, Nogueira MS, Pelá IR. [Pharmacotherapy in the elderly: a review about the multidisciplinary team approach in systemic arterial hypertension control]. Rev Lat Am Enfermagem. 2006;14(3):435-41.

15. Rajska-Neumann A, Wieczorowska-Tobis K. Polypharmacy and potential inappropriateness of pharmacological treatment among community-dwelling elderly patients. Arch Gerontol Geriatr. 2007;44(Suppl. 1):303-9.

16. Lyra Júnior DP, Prado MCTA, Abriata JP, Pelá IR. **Prescription orders as cause of risk of drug-related problems.** Seguim Farmacoter. 2004;2(1):86-96.

17. Rollason V, Vogt N. Reduction of polypharmacy in the elderly: a systematic review of the role of the pharmacist. Drugs Aging. 2003;20(11):817-32.

18. Solera BJJ, Munõz GP, Schmolling Y. Cumplen correctamente el tratamiento farmacológico nuestros hipertensos? In: VII Premios en investigación primaria. Gap Talavera [internet]. [Cited on 2009 Oct 22]. Available from: http://www.gaptalavera.sescam.jccn.es/web1/gaptalavera/prof_home/evento/1premiomedicina_hta.pdf.

19. Rudd P. Clinicians and patients with hypertension: unsettled issues about compliance. Am Heart J. 1995;130(3 Pt 1):572-9.

20. Melo A, Nogueira AR, Muxfeldt ES, Salles GF, Bloch K. Three strategies of treatment adherence evaluation in resistant hypertension: comparative analyze. J Hypertens. 2005;23:S189.

21. Strelec MA, Pierin AM, Mion D Jr. The influence of patient's consciousness regarding high blood pressure and patient's attitude in face of disease controlling medicine intake. Arq Bras Cardiol. 2003;81(4):343-8.

22. Prado JC Jr, Kupek E, Mion D Jr. Validity of four indirect methods to measure adherence in primary care hypertensives. J Hum Hypertens. 2007;21(7):579-84.

23. Pierin AM, Ignez EC, Jacob Filho W, Barbato AJ, Mion D Jr. Blood pressure measurements taken by patients are similar to home and ambulatory blood pressure measurements. Clinics (Sao Paulo). 2008;63(1):43-50.

24. Shaw K, Gennat H, O'Rourke P, Del Mar C. Exercise for overweight or obesity. Cochrane Database Syst Rev. 2006;4:CD003817.

25. Jones DW. Dietary sodium and blood pressure. Hypertension. 2004;43(5):932-5.

26. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, et al; DASH-Sodium Collaborative Research Group. Effects on blood pressure of reduced dietary sodium and the dietary approaches to stop hypertension (DASH) diet. N Engl J Med. 2001;344(1):3-10.

27. Intersalt Cooperative Research Group. Intersalt: an international study of electrolyte excretion and blood pressure: results for 24 hour urinary sodium and potassium. BMJ. 1988;297(6644):319-28.

28. Geleijnse JM, Witteman JCM, Bak AA, den Breijen JH, Grobbee DE. Reduction in blood pressure with a low sodium, high potassium, high magnesium salt in older subjects with mild to moderate hypertension. BMJ. 1994;309(6952):436-40.

29. Whelton PK, Appel LJ, Espeland MA, Applegate WB, Ettinger WH Jr, Kostis JB, et al. Sodium reduction and weight loss in the treatment of hypertension in older persons: a randomized controlled trial of nonpharmacologic interventions in the elderly (TONE). TONE Collaborative Research Group. JAMA. 1998;279(11):839-46.

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