INFOGRAPHIC

Achieving blood pressure control with monotherapy: real-world evidence from office and home blood pressure measurements

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Despite guidelines discouragement, antihypertensive monotherapy (AH-mono) remains widely used. This study assessed AH-mono prevalence and blood pressure control rates based on office and home measurements (OBP/HBPM) using contemporary targets (<130/80 mmHg). Three distinct cohorts undergoing OBP/HBPM assessments between July 2018 and July 2024 were analyzed: cohort 1 (n = 63 164) included treated patients with a single OBP/HBPM measurement; cohort 2 (n = 5676) comprised treated patients with two OBP/HBPM assessments at different time points; and cohort 3 (n = 974) involved individuals with OBP/HBPM measurements before and after initiating antihypertensive therapy. The prevalence of AH-mono was 42.7% in cohort 1, 36.6 and 32.4% in cohort 2, and 50.7% in cohort 3. Among those receiving AH-mono, OBP/HBPM control rates were 8.5% in cohort 1, 6.7 and 7.3% in Cohort 2, and 7.7% in cohort 3. These real-world findings highlight the persistent high prevalence of AH-mono despite its limited efficacy, with less than 10% of patients achieving blood pressure control.

Graphical abstract: http://links.lww.com/HJH/C820

Keywords: antihypertensive therapy, home blood pressure monitoring, hypertension

Abbreviations: ACEI, angiotensin-converting enzyme; AH-mono, antihypertensive monotherapy; ARB, angiotensin receptor blockers; AUC, area under the curve; BP, blood pressure; CCB, calcium channel blockers; HBPM, home blood pressure monitoring; OBP, office blood pressure; SD, standard deviation

INTRODUCTION

Hypertension control rates have remained low and antihypertensive monotherapy (AH-mono) have remained widely used over the years [1,2]. Consequently, recent guidelines have advocated for more intensive treatment strategies, including discouraging AH-mono use for most hypertensive patients [1,3,4]. While it is plausible that AH-mono contributes to ineffective blood pressure (BP) control, contemporary evidence is needed to determine whether its use is driven by adequate BP control or reflects therapeutic inertia.

Previous studies using the former office BP (OBP) target (<140/90 mmHg) reported that AH-mono was sufficient for 20–40% of patients [5,6]. However, emerging evidence supports the benefits of lower BP targets, and current guidelines now recommends OBP levels less than 130/80 mmHg [1,4]. Furthermore, these guidelines emphasize the importance of out-of-office measurements, such as home BP monitoring (HBPM), due to superior predictive value compared to OBP [1,4]. Given these changes, the appropriateness of AH-mono in achieving OBP and HBPM targets needs to be reassessed in contemporary cohorts of hypertensive patients. This study was designed to address this need.

METHODS

We evaluated a large multicenter sample of Brazilian individuals aged at least 18 years and underwent both OBP/HBPM measurements between July 2018 and July 2024, using an online platform (www.telemrpa.com). The sample was obtained from three cohorts.

Cohort 1 comprised 63 164 consecutive hypertensive individuals on antihypertensive therapy from 1096 Brazilian centers. Each participant underwent a single set of OBP/

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HBPM measurements, with a cross-sectional design. Cohort 2 included 5676 consecutive hypertensive individuals on antihypertensive therapy from 319 Brazilian centers, each with two OBP/HBPM measurements taken at least 30 days apart. Cohort 3 consisted of 974 consecutive individuals from 226 Brazilian centers, with OBP/HBPM measurements conducted before initiating antihypertensive therapy and a second set obtained at least 30 days after treatment initiation. The protocol was approved by the Oswaldo Cruz University Hospital/PROCAPE Complex Ethics Committee, which waived the requirement for informed consent (CAAE: 39276920.9.0000.5192).

Data collection included age, sex, BMI, use of antihypertensive and antidiabetic medications, OBP, and HBPM. Diabetes was defined by antidiabetic medication use. BP measurements were taken with the participants seated, using appropriately sized arm cuffs [7]. OBP/HBPM were measured using the same validated devices (HEM-705CP, HEM-7320, HEM-9200T, or HEM-7113; Omron Healthcare, Japan), following a previously established protocol [8]. OBP was calculated as the average of two measurements taken by healthcare professionals after 3 min of rest. HBPM began the next day, with participants taking three readings each morning and evening for 4 days before meals and medication, requiring at least 14 valid readings. HBPM values were calculated as the average of all home BP measurements. BP was considered controlled if both OBP/HBPM were less than 130/80 mmHg. For comparison purposes with previous studies, we also assessed the rates of OBP less than 140/90 mmHg.

Continuous normal and nonnormal variables are presented as mean ± SD and median [25th, 75th percentiles], and categorical variables as proportions. Paired *t* test and McNemar test compared paired data, while chi-squared test compared unpaired categorical variables. Multivariable logistic regression analysis, adjusted for age, sex, BMI, diabetes, and center assessed the relationship between antihypertensive therapy use and BP control over calendar time. A *P* value less than 0.05 was considered significant. Analyses were conducted in Stata 14.2 (Stata Corp, Texas, USA).

RESULTS

The characteristics of the three cohorts are presented in Table 1. In cohort 1, 26.9, 41.5, and 20.2% of the patients had controlled OBP, HBPM, and OBP/HBP, and 42.7% on AH-mono. Patients on AH-mono with controlled OBP,

TABLE 1. Characteristics of patients across three cohorts

	Cohort 1 (*n* = 63 164)	Cohort 2 (*n* = 5676)			Cohort 3 (*n* = 974)		
Variables	Single measure	First measure[a]	Second measure[a]	*P* value	First measure[b]	Second measure[b]	*P* value
Male sex (%)	36	34	34	–––	41	41	–––
Age (years)	61 ± 15	62 ± 14	64 ± 14	<0.001	58 ± 15	60 ± 15	<0.001
BMI (kg/m^2)	29.0 ± 5.4	28.9 ± 5.3	28.8 ± 5.3	0.012	28.0 ± 4.9	28.1 ± 5.0	0.32
Diabetes (%)	8.3	10.7	13.0	<0.001	1.2	7.2	<0.001
Office SBP (mmHg)	133 ± 21	134 ± 21	132 ± 20	<0.001	141 ± 18	132 ± 19	<0.001
Office DBP (mmHg)	83 ± 12	83 ± 12	82 ± 12	<0.001	89 ± 11	83 ± 12	<0.001
Home SBP (mmHg)	127 ± 16	128 ± 16	126 ± 16	<0.001	132 ± 15	126 ± 15	<0.001
Home DBP (mmHg)	79 ± 10	79 ± 11	78 ± 10	<0.001	83 ± 10	79 ± 9	<0.001
Number of AH classes (%)							
Monotherapy	42.7	36.6	32.4	<0.001	0	50.7	<0.001
Combined therapy	57.3	63.4	67.6	<0.001	0	49.3	<0.001
AH classes (%)							
ARB (%)	67.2	69.0	69.9	0.09	0	62.0	<0.001
ACEI (%)	17.6	17.3	17.6	0.44	0	20.1	<0.001
Diuretics (%)	36.5	40.1	41.8	0.011	0	31.1	<0.001
CCB (%)	29.3	33.6	37.4	<0.001	0	31.0	<0.001
Beta-blockers (%)	29.7	32.6	33.2	0.25	0	23.8	<0.001
Alpha2-agonists (%)	2.3	2.6	2.5	0.86	0	2.2	<0.001
Direct vasodilators (%)	1.1	1.2	1.6	0.011	0	1.1	<0.001
Spironolactone (%)	4.0	5.5	7.3	<0.001	0	3.1	<0.001
OBP<140/90 mmHg (%)	55.9	58.0	58.3	0.74	36.5	55.9	<0.001
Monotherapy	24.6[c]	22.0[c]	19.9[c]	<0.001	0	28.9	<0.001
Combined therapy	31.3	36.0	38.4	<0.001	0	27.0	<0.001
OBP<130/80 mmHg (%)	26.9	27.1	31.3	<0.001	5.2	25.4	<0.001
Monotherapy	11.4[c]	9.6[c]	10.4[c]	0.14	0	12.4	<0.001
Combined therapy	15.5	17.5	20.9	<0.001	0	13.0	<0.001
HBPM <130/80 mmHg (%)	41.5	40.7	44.6	<0.001	19.0	38.8	<0.001
Monotherapy	17.6[c]	14.5[c]	14.0[c]	0.36	0	17.0[c]	<0.001
Combined therapy	23.9	26.2	30.6	<0.001	0	21.8	<0.001
OBP and HBPM <130/80 mmHg (%)	20.2	19.6	23.0	<0.001	0	18.0	<0.001
Monotherapy	8.5[c]	6.7[c]	7.3[c]	0.17	0	7.7[c]	<0.001
Combined therapy	11.7	12.9	15.7	<0.001	0	10.3	<0.001

ACEI, angiotensin-converting enzyme inhibitor; AH, antihypertensive medications; ARB, angiotensin receptor blockers; CCB, calcium channel blockers; HBPM, Home blood pressure monitoring; OBP, office blood pressure. Paired *t* tests were used for continuous variables, and McNemar tests for categorical variables, to compare the first and second measurements in cohorts 2 and 3.
[a]Time span between the first and second BP measurement: median [25th percentile, 75th percentile] = 421 [232, 701] days.
[b]Time span between the first and second BP measurement: median [25th percentile, 75th percentile] = 575 [294, 933] days.
[c]$P < 0.05$ compared to combined therapy assessed by chi-squared test.

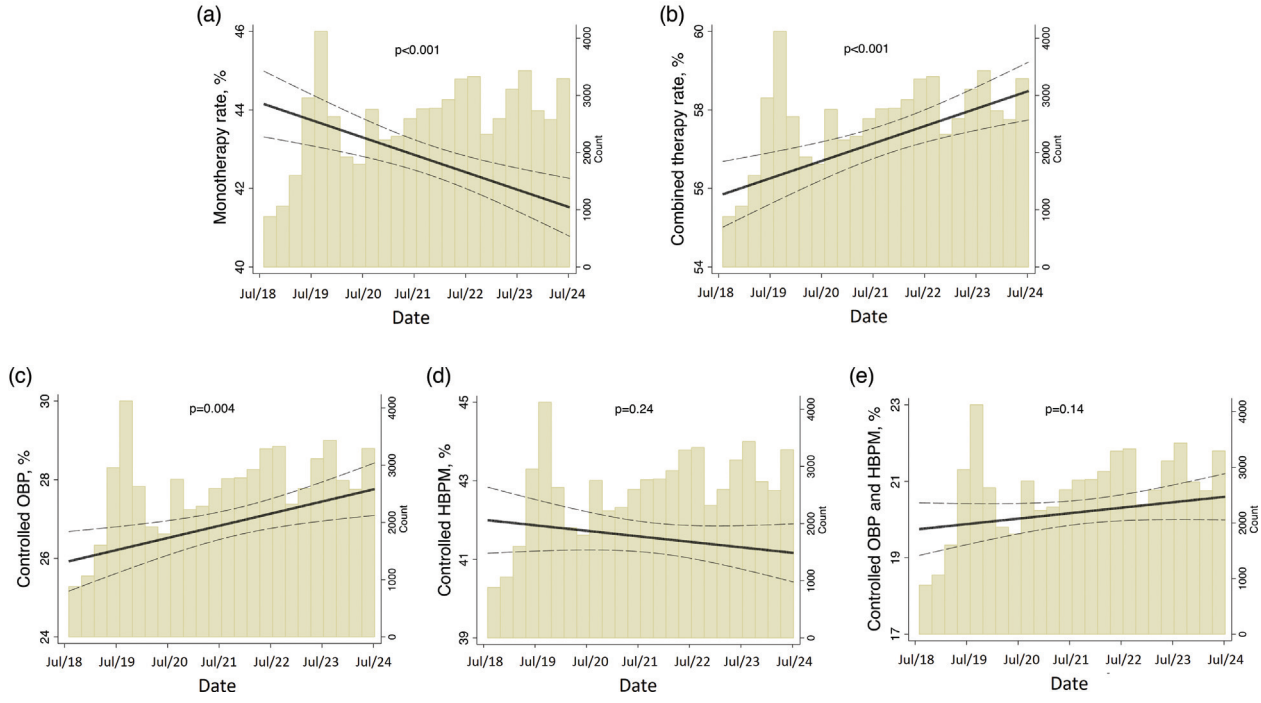

FIGURE 1 Adjusted logistic regression analysis for the relationship of the prevalence of monotherapy, combined therapy and controlled blood pressure (<130/80 mmHg) with calendar time among patients of cohort 1. All analyses were adjusted for age, sex, BMI, diabetes and center. The dashed lines indicate the 95% confidence intervals. The brown bars are histograms of the distribution of HBPM exams per 3 months. BP, blood pressure; HBPM, home BP monitoring; OBP, office blood pressure.

HBPM, and OBP/HBPM comprised 11.4, 17.6, and 8.5% of cohort 1. Over the evaluation period (2018–2024), the prevalence of AH-mono use declined (from ~44 to ~42%; $P < 0.001$), accompanied by an increase in combined therapy use (from ~56 to ~58%; $P < 0.001$) and a modest improvement in controlled OBP rates (from ~26 to ~28%; $P = 0.004$) over time (Fig. 1a–c). In contrast, the rates of controlled HBPM remained largely unchanged (Fig. 1a and e).

In cohort 2, the rates of controlled OBP, HBPM, and OBP/HBPM increased (all $P < 0.001$) from 27.1 to 31.3%, from 40.7 to 44.6%, and from 19.6 to 23.0%, respectively, while AH-mono use rate decreased from 36.6 to 32.4% ($P < 0.001$) overtime (time span between BP measurements = 421 [232, 701] days). Patients on AH-mono with controlled OBP, HBPM, and OBP/HBPM comprised 9.6–10.4, 14.5–14, and 6.7– 7.3%, respectively, of the cohort 2 sample at the studied time points (Table 1). In cohort 3, 25.4, 38.8, and 18% of the sample had controlled OBP, HBPM, and OBP/HBPM, while 50.7% were on AH-mono after starting antihypertensive therapy. Patients on AH-mono with controlled OBP, HBPM, and OBP/HBPM comprised 12.4, 17, and 7.7% of the cohort 3 sample (Table 1).

Patients using AH-mono and OBP less than 140/90 mmHg comprised 24.6% of cohort 1, 22.9 and 19.9% of cohort 2 and 28.9% of cohort 3 (Table 1). Additionally, patients using AH-mono had lower OBP/HBPM control rates than those on combined therapy across all three cohorts (Table 1). Women and younger individuals were more likely to have higher OBP/HBPM control rates using AH-mono, especially in cohort 1 and cohort 2 (Supplemental Table 1, http://links.lww.com/HJH/C821), while patients using beta-blockers as AH-mono had greater OBP/HBPM control rates in cohort 1 and cohort 2, and those using diuretics as AH-mono had higher OBP/HBPM control rates in cohort 3 (Supplemental Table 2, http://links.lww.com/HJH/C821).

DISCUSSION

The present study evaluated three distinct cohorts of treated hypertensive patients and demonstrated that only 6.7 to 8.5% of the patients had controlled OBP/HBPM with AH-mono. Our findings suggest that clinicians frequently persist with AH-mono despite inadequate BP control, a behavior that becomes even more pronounced when applying contemporary OBP/HBPM targets (<130/80 mmHg) [1,3,4]. Moreover, given that HBPM provides additional prognostic value beyond OBP [1–3] and detects more individuals with uncontrolled BP, these results underscore the necessity of integrating out-of-office BP measurements, such as HBPM, into routine clinical practice.

Despite the low rates of BP control with AH-mono, we found elevated rates of AH-mono use in our studied cohorts, ranging from 32.4 to 50.7%, which are similar to those reported in alternative countries [9]. Notably, we also detected slight albeit significant decreases in AH-mono use overtime in cohort 1 and cohort 2. These findings suggest that recommendations of current guidelines for a widespread use of combined antihypertensive therapy [1–3] may be exerting positive effects, but are still insufficient to overcome therapeutic inertia in real-world settings. Moreover, women and younger individuals had better BP control on monotherapy, especially in cohort 1 and cohort 2, suggesting that demographic factors may influence treatment response.

Consistent with previous studies [5,6], 20–29% of patients on AH-mono achieved the former OBP target of less than 140/90 mmHg. These findings suggest that the novelty of the present study lies more in the adoption of lower BP targets and the inclusion of HBPM measurements rather than in significant changes in clinical practice. Conversely, the shift of OBP target from less than 140/90 mmHg to less than 130/80 mmHg markedly reduced BP control rates, highlighting the increased challenge posed by current guidelines.

This report has some limitations. The cross-sectional design may have introduced selection bias, potentially affecting patient characteristics and results. Additionally, OBP measurements did not fully adhere to guidelines [1], and antihypertensive dosage information was unavailable.

In conclusion, these real-world data indicate that AH-mono use remains highly prevalent and that the control rate for both OBP and HBPM occur in less than 10% of hypertensive patients under treatment. These findings emphasize the need for more effective strategies to increase the adoption of combined antihypertensive therapy and adherence to guidelines recommendations.

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Data availability statement: the datasets generated during and/or analyzed during the current study are not publicity available but are available from the corresponding author on reasonable request.

Conflicts of interest

There are no conflicts of interest.

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