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May Measurement Month 2019: an analysis of blood pressure screening results from Venezuela, Latin America

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Cardiovascular diseases are the main cause of death in Venezuela. Raised blood pressure (BP) accompanied by diabetes mellitus, obesity, lipid abnormalities, and tobacco usage are the biggest contributors to mortality. The May Measurement Month (MMM) campaign is a global initiative aimed to raising awareness of hypertension, which has been conducted in Venezuela since 2017. MMM2019 included 24 672 subjects (mean age: 54.7 years, SD 25.2, 63.1% female). The proportion with hypertension was 48.9%; 14.3% were unknown hypertensives, 35.5% of those who receiving treatment had uncontrolled hypertension (systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg); when considering all hypertensives, 53.3% were controlled. Sixty per cent of those on anti-hypertensive medication were on monotherapy, 27.7% were on two, and 7.7% were on three or more drugs. Body mass index, calculated for the total population, was on average 25.6 (SD: 4.8) kg/m². 16.2% of participants were classified as obese, 34.0% as overweight, and 4.0% were classified as underweight. Diabetes mellitus was reported by 9.4%, smoking by 7.3%, and 10.5% reported drinking alcohol regularly. Conditions associated with higher BP levels were obesity, diabetes mellitus, and women with a history of hypertension during a previous pregnancy. These results are consistent with the two previous MMM campaigns and indicate that repeated screening can routinely identify hypertension. There is an urgent need for Venezuela to implement programmes of detection, treatment, and control not only for hypertension but also for other common cardiovascular risk factors.

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Introduction

In Venezuela, cardiovascular diseases represent 30% of all deaths, according to the register of Pan American Health Organization. Cardiovascular mortality per 100 000 inhabitants, for both sexes combined, was 207.3, ischaemic heart disease 126.1, and stroke 53.0; meanwhile, the mortality for diabetes mellitus was 57.3¹; males have higher rates. Hypertension is the main risk factor for cardiovascular disease, accompanied, commonly by diabetes mellitus, obesity, lipid abnormalities, smoking, and low physical activity.

Pan American Health Organization reported a prevalence of hypertension for Venezuela, of 21.5% and 15.7%; diabetes mellitus of 9.9% and 9.0% for male and female, respectively. In 2008, the CARMELA study, with a representative sample aged 25-64 years old, estimated prevalence's to be (both sexes combined) 24.7% for hypertension, 6% for diabetes mellitus, and 25.1% for obesity.² In contrast, in the MMM2017 and MMM2018 campaigns, the prevalence of hypertension aged 18-94 years old, was reported as 48.9% and 48.4%, respectively, which were higher than the American Continent or worldwide proportions in both campaigns using the same methodology. Diabetes mellitus was reported in 10.7% and 9.5%; obesity reported in 16.2% and 14.2% in both campaigns, respectively.^{3,4}

The aim of the MMM2019 campaign was to raise awareness of the importance of measuring blood pressure (BP) in the Venezuelan population and therefore, it will help to improve hypertension management in this country.

Methods

The protocol was approved by the ethics committee at Dean of Health Sciences of the University Centro Occidental Lisandro Alvarado, Venezuela. Ninety-four screening sites in eight Venezuelan regions were included. Three to five people were involved in the collection of data for each site. The Venezuelan chain of pharmacies, FARMATODO, teamed up to share space from their branches and their trained pharmacists and other staff to collaborate in carrying out the study during May and June 2019.

A short questionnaire⁵ was completed, then BP in the sitting position was measured three times, as well as height and weight. The data were entered on paper forms and then transferred to spreadsheets and sent to May Measurement Month (MMM)'s central database.

Hypertension was defined as systolic blood pressure (SBP) ≥ 140 mmHg or diastolic blood pressure (DBP) ≥ 90 mmHg (based on the mean of the 2nd and 3rd BP reading) or on pharmacological treatment for hypertension. Weight and height were measured, and body mass index was calculated, using the WHO classification. Analysis of the data was carried out centrally by the global MMM project team, using methods previously published.⁵ For those participants missing either the 2nd or 3rd BP measurement (or both), multiple imputations using chained equations was used to estimate the missing reading based on global data, to provide better comparisons across all participants.⁵

Results

The number of participants included from Venezuela was 24 672 with a mean age of 54.7 years (SD 15.2). Only 11% previously participated in 2017/18 screenings. More women were included (61.1%) than men, the self-reported ethnicity was predominantly mixed (64.4%) followed by white (30.1%), and black (4.2%). 9.4% of participants reported having diabetes, 3.2% had a previous myocardial infarction, 2.0% had a previous stroke, 7.3% were current smokers, 10.4% were taking aspirin, and 9.1% statins.

Blood pressure was measured three times in 99.3% of subjects. The mean of the 2nd and 3rd BP readings was 123.8/76.5 mmHg.

After imputing the missing values in our dataset, 12 067 (48.9%) participants were estimated to have hypertension; 2102 (14.3%) of those not receiving antihypertensive treatment were found with elevated BP (unknown hypertensives) and 3539 (35.5%) of those receiving treatment had uncontrolled hypertension. Of 9965 participants on antihypertensive medication, 64.5% had controlled BP. Of all 12 067 participants with hypertension, 53.3% had controlled BP. Of the hypertensives on treatment, 60.0% take only one drug, 27.7% two drugs, and 7.7% take three or more drugs; 4.6% reported taking medication but not the number of drugs.

Body mass index, calculated for the total sample, was on average 25.6 (SD: 4.8) kg/m². 16.2% were classified as obese, 34.0% as overweight, and 4.0% as underweight. After adjusting for age, sex and antihypertensive medication, obesity, and overweight were associated with higher levels of either systolic or diastolic BP ([Supplementary material online, Figure S1](#)).

After adjustments for age and sex, significantly higher systolic and diastolic BPs were apparent in subjects who were receiving antihypertensive drug treatment. Systolic BP in participants with self-reported diabetes or previous myocardial infarction was higher than in those without ([Supplementary material online, Figure S2](#)). Current smoking was associated with lower systolic BP [-1.09 mmHg, 95% CI ($-1.96, -0.21$)] than in non-smokers; however, no significant difference in diastolic BP was observed ([Supplementary material online, Figure S3](#)). There was strong evidence ($P < 0.001$) to suggest pregnant women had lower systolic and diastolic BPs [-3.39 95% CI ($-5.67, -1.12$) and -2.50 95% CI ($-3.83, -2.17$), respectively] than non-pregnant women. Women with a history of previous hypertension during pregnancy had higher systolic and diastolic BPs [4.11 , 95% CI ($3.15, 5.07$) and 2.59 95% CI ($2.03, 3.15$), respectively] than women without such a history. Participants who were fasting had significantly higher systolic and diastolic BP compared with non-fasting participants ([Supplementary material online, Figure S3](#)).

Blood pressures taken on Saturday and Sunday, both systolic and diastolic, were associated with lower BPs compared with Monday.

Discussion

The percentage of people with hypertension was 48.9%, which was consistent with the previous MMM campaigns in

2017 and 2018 (48.9% and 48.4%, respectively). These proportions are higher than previously reported in the American Continent (41.2%) and worldwide (34.0%).⁵

In Venezuela, 14.3% were unknown hypertensives compared with 17.3% globally and 18.6% in the Americas.⁵ The proportion of participants with controlled hypertension in Venezuela was 53.3%, compared with 31.72% and 42.6% for the worldwide or Americas data, respectively.⁵

The proportion of subjects classified as obese and underweight was 16.2% and 4%, respectively, compared with 14.2% and 4.8% in the MMM2018 campaign and 16.0% and 3.1% in the 2017 campaign. In contrast, obesity was reported in 25.1% in the CARMELA study² carried out in 2008 and 24.6% in EVASCAM study⁶ carried out between 2014 and 2016, suggesting a possible reduction in the proportion of obesity in Venezuela.

In MMM2019, diabetes was present in 9.4% of individuals in contrast to 10.7% and 9.5% reported in MMM2017 and MMM2018, respectively.^{3,4}

The strongest factors linked with mean SBPs in our study were known hypertension ($P < 0.001$), use of antihypertensive medication ($P < 0.001$), and diabetes ($P < 0.001$). Smoking was associated with lower SBP ($P = 0.015$). Alcohol intake once or more per week was not associated with important changes in either systolic or diastolic BP compared with no alcohol intake, in contrast to the findings of previous years.

In conclusion, this cross-sectional survey in Venezuela allows us to state: the proportion of hypertension in Venezuela from MMM has maintained the same level since the 2017 campaign and continues to be higher than the worldwide or American averages. Most hypertensives take one antihypertensive medication to treat hypertension. One-third of treated hypertensives were not controlled, and about 10% of subjects take aspirin and/or statins. Obesity and diabetes mainly influence systolic BP.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal Supplements* online.

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References

1. Pan American Health Organization/World Health Organization, Evidence and Intelligence for Action in Health Department/Health Analysis, Metrics and Evidence Unit. PLISA Database. *Core Indicators 2019: Health Trends in the Americas*. Washington, DC; 2019. <https://iris.paho.org/handle/10665.2/51542> (2 December 2020).
2. Scharogradsky H, Hernández-Hernández R, Champagne BM, Silva H, Vinuesa R, Silva Ayçaguer LC, Touboul PJ, Boissonnet CP, Escobedo J, Pellegrini F, Macchia A, Wilson E, CARMELA Study Investigators. CARMELA: assessment of cardiovascular risk in seven Latin American cities. *Am J Med* 2008;**121**:58-65.
3. Hernández-Hernández R, Octavio-Seijas JA, Morr I, López-Rivera J, Gúzman-Franolic ML, Costantini-Olmos AP, Silva E, Méndez-Amaya NC, Duin A, Vásquez D, Ruíz-Lugo JF, Marval J, Duin JCC, Ponte-Negretti CI, Beaney T, Kobeissi E, Poulter NR. Results of the May Measurement Month 2017: blood pressure campaign in Venezuela-Americas. *Eur Heart J Suppl* 2019;**21**:D124-D126.
4. Hernández-Hernández R, Duin A, Octavio-Seijas JA, López-Rivera J, Morr I, Silva E, Gúzman-Franolic ML, Costantini-Olmos AP, Marval J, Ruíz-Lugo JF, Vásquez D, Méndez-Amaya NC, Armas-Hernández MJ, Beaney T, Ster AC, Poulter NR. Results of May Measurement Month 2018 campaign in Venezuela. *Eur Heart J Suppl* 2020;**22**:H135-H138.
5. Beaney T, Schutte AE, Stergiou GS, Borghi C, Burger D, Charchar F, Cro S, Diaz A, Damasceno A, Espeche W, Jose AP, Khan N, Kokubo Y, Maheshwari A, Marin MJ, More A, Neupane D, Nilsson P, Patil M, Prabhakaran D, Ramirez A, Rodriguez P, Schlaich M, Steckelings UM, Tomaszewski M, Unger T, Wainford R, Wang J, Williams B, Poulter NR, on behalf of MMM Investigators. May Measurement Month 2019. The global blood pressure screening campaign of the International Society of Hypertension. *Hypertension* 2020;**76**:333-341.
6. Nieto-Martínez R, González-Rivas JP, Ugel E, Duran M, Dávila E, Constantino R, García A, Mechanick JI, Marulanda MI. Cardiometabolic risk factors in Venezuela. The EVASCAM study: a national cross-sectional survey in adults. *Prim Care Diabetes* 2021;**15**: 106-114.