

## Results of May Measurement Month 2018 campaign in Venezuela

Rafael Hernández-Hernández<sup>1\*</sup>, Amanda Duín<sup>1</sup>, José Andrés Octavio-Seijas<sup>2</sup>, Jesús López-Rivera<sup>3</sup>, Igor Morr<sup>2</sup>, Egle Silva<sup>4</sup>, Mónica L. Gúzman-Franolic<sup>5</sup>, Antonieta P. Costantini-Olmos<sup>5</sup>, José Marval<sup>6</sup>, José Félix Ruíz-Lugo<sup>6</sup>, Dámaso Vásquez<sup>6</sup>, Nedina Coromoto Méndez-Amaya<sup>6</sup>, Maria J. Armas-Hernández<sup>1</sup>, Thomas Beaney<sup>7,8</sup>, Anca Chis Ster<sup>7</sup>, and Neil R. Poulter<sup>7</sup>

<sup>1</sup>Hypertension and Cardiovascular Risk Factors Clinic, School of Medicine, Universidad Centro Occidental Lisandro Alvarado, Barquisimeto, Venezuela;

<sup>2</sup>Department of Experimental Cardiology. Tropical Medicine Institute, Universidad Central de Venezuela;

<sup>3</sup>Hypertension Unit, General Hospital, San Cristóbal, Venezuela;

<sup>4</sup>Instituto de Investigaciones de Enfermedades Cardiovasculares de LUZ. Universidad del Zulia, Maracaibo, Venezuela;

<sup>5</sup>FARMATODO pharmacy group, Caracas, Venezuela;

<sup>6</sup>Venezuelan Society of Cardiology and Venezuelan Society of Hypertension;

<sup>7</sup>Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London W12 7RH, UK; and

<sup>8</sup>Department of Primary Care and Public Health, Imperial College London, St Dunstan's Road, London W6 8RP, UK

### KEYWORDS

Hypertension;  
Body mass index

Cardiovascular diseases, mainly coronary heart disease and stroke, are the main cause of death in Venezuela; hypertension is the primary risk factor. The May Measurement Month (MMM) study is a global initiative aimed at raising awareness of elevated blood pressure (BP). The previous MMM 2017 campaign showed 48.9% of participants had hypertension, higher than previous Venezuelan epidemiological studies. The MMM 2018 campaign included 28 649 participants screened [mean age: 54.2 (SD 15.13) years; female 62.8%] carried out mainly in pharmacies in 61 sites. Physical measurements included height, weight, and BP, taken in sitting position three times. After multiple imputations, 48.4% had hypertension, of which 87.7% were aware of their diagnosis. Of the individuals not receiving antihypertensive medication, 14.0% had hypertension and 33.7% of those receiving treatment had uncontrolled hypertension. Overall, the percentage of hypertensives with controlled hypertension was 54.8%. Body mass index was calculated for the total population, and it was on average 25.2 (SD: 4.65) kg/m<sup>2</sup>. Of all, 14.2% was classified as obese and 32.6% as overweight; meanwhile 4.8% as underweight. Diabetes was reported by 9.5%. These results suggest that repeated screening like the MMM campaign can routinely identify hypertension and consequently implement programmes of treatment in Venezuela, also other common risk factors, like obesity or diabetes.

\*Corresponding author. Email: rafael.hernandez.h@gmail.com

## Introduction

In Latin America, almost 1 million cardiovascular deaths occur annually being coronary heart disease, stroke, and hypertension reported as the primary cause of death.<sup>1</sup> In Venezuela, cardiovascular diseases are the primary cause of death mainly coronary heart disease, stroke, and heart failure.<sup>2</sup> Hypertension is the principal risk factor for cardiovascular disease, accompanied by diabetes mellitus, obesity, lipid abnormalities, smoking, and low physical activity.

In the 2008 CARMELA study, in a representative population of 25- to 64-year-olds, the prevalence of hypertension for Venezuela was estimated to be 24.7%; diabetes mellitus was 6% and obesity measured by body mass index (BMI) was 25.1%.<sup>3</sup> In contrast, in the MMM2017 campaign the percentage of current hypertension was 48.9% which was higher, than the American Continent (41%) or worldwide (34.9%) proportions. Diabetes was reported in 10.7% and obesity in 16.2% among 21 644 participants.<sup>4</sup>

The aims of this version of the MMM campaign were to raise awareness of the importance of blood pressure (BP) in the Venezuelan population and enhance the quality of data and to compare data to previous MMM study.

## Methods

The protocol was approved by the ethics committee at Dean of Health Sciences of University Centro-Occidental Lisandro Alvarado, Venezuela. Sixty-one screening sites were distributed in eight regions and about four people were involved in collection of data for each site. The Venezuelan chain of pharmacies, FARMATODO, collaborated to share their branches including pharmacists and personnel properly trained to carry out the study during May and June 2018. Other small groups of subjects were included from universities and health centres.

A short questionnaire was filled in as published elsewhere.<sup>5</sup> Measurements were then carried out including BP, height, and weight. Blood pressure was measured in the sitting position three times after resting for at least 5 min, 1 min apart. Blood pressure was taken from either arm, using validated oscillometric devices of different brands. Data were entered on paper forms and later transferred to spreadsheets and transmitted to the central MMM database.

Hypertension was defined as systolic blood pressure (SBP)  $\geq$  140 mmHg or diastolic blood pressure (DBP)  $\geq$  90 mmHg or on pharmacological treatment for hypertension. Weight and height were measured in all cases, and body mass index was calculated, using WHO classification. Analysis of data was carried out centrally by the global MMM project team using the method previously published, with multiple imputation performed based on global data<sup>5</sup> to impute missing values of the second and third BP reading.

## Results

The number of participants included from Venezuela was 28 649 subjects with a mean age of 54.2 years (SD 15.1). More women were included (62.8%), the self-reported ethnicity was predominantly mixed (65.0%) followed by white (30.0%), and black (4.8%). 9.5% of participants reported having diabetes, 4.3% had a previous myocardial infarction, 2.4% had a previous stroke; and 8.7% were current smokers.

Blood pressure was measured three times in 99.3% of subjects. The average BP in 1st, 2nd, and 3rd readings were 125.9/77.1 mmHg, 123.7/75.9 mmHg, and 122.6/75.3 mmHg, respectively; the average of 2nd and 3rd readings was 123.4/75.9 mmHg. For analysis, the average of 2nd and 3rd readings were used.

After imputing the missing values in our dataset, 13 861 (48.4%) participants were estimated to have hypertension; 2415 (14.0%) of those not receiving antihypertensive treatment were found with elevated BP (unknown hypertensives) and 3854 (33.7%) of those receiving treatment had uncontrolled hypertension. The percentage of all hypertension that was controlled was 54.8.

Body mass index calculated for the total population was on average 25.2 (SD: 4.7) kg/m<sup>2</sup>. Of all, 14.2% were classified as obese and 32.6% as overweight; meanwhile 4.8% as underweight. After adjusting for age and sex (with an interaction) and anti-hypertensive medication, we found a strong association between BMI and BP. A participant that was considered overweight or obese was associated with higher SBP and DBP measurements than participants who were a healthy weight. Conversely, a participant that was underweight was associated with lower SBP and DBP measurements compared to participants with a healthy weight ([Supplementary material online, Figure S1](#)).

After adjustment for age and sex, significantly higher SBP and DBP were apparent in subjects who were receiving antihypertensive drug treatment compared with those not on such treatment. Only systolic BP was higher for subjects with self-reported diabetes or previous myocardial infarction compared with those without diabetes or a previous myocardial infarction. Participants who were current smokers were associated with lower SBP/DBP levels ( $-1.43$  mmHg, 95% CI  $-2.18$  to  $-0.69$ /0.45 mmHg, 95% CI  $-0.73$  to  $-0.10$ ), respectively than those who did not smoke. There was strong evidence ( $P < 0.001$ ) to suggest pregnant women had lower systolic and diastolic BPs [ $-3.93$ , 95% CI  $-6.00$  to  $-1.86$ ] and  $-3.35$ , 95% CI  $-4.57$  to  $-2.13$ ] respectively ([Supplementary material online, Figures S2 and S3](#)).

## Discussion

The Venezuelan MMM2018 campaign included a sample of 28 649 subjects; the percentage of people with hypertension was 48.4% which was consistent with the previous campaign 2017 (48.9%), but higher than for the American Continent (40.4%) or worldwide (33.4%).<sup>5</sup>

Of those individuals not receiving hypertension drug treatment, 14.0% were hypertensive in Venezuela, compared to 17.9% globally and 15.7% in the Americas.<sup>5</sup> The proportion of participants with controlled hypertension was 54.8% compared to 43% and 33.2% for the Americas or worldwide data, respectively.<sup>5</sup>

Obesity was prevalent in 14.2% of participants and 4.8% were underweight in the present campaign comparing to 16.0% and 4.1%, respectively of individuals included in the MMM2017 campaign.<sup>6</sup> Carballo-Arias<sup>7</sup> reported important changes in the economy, job situation, and health in Venezuela since 2006 and a recent *Lancet* editorial described how the humanitarian, economical, and health crisis is deteriorating.<sup>8</sup> This may explain reductions in the prevalence of obesity in the Venezuelan population since obesity in the CARMELA study was reported in 25.1%.<sup>3</sup>

In the present study, diabetes was present in 9.5% of individuals in contrast to 10.7% of cases reported last year.<sup>6</sup>

The strongest factors on mean SBP in our study were: known hypertension ( $P < 0.001$ ), antihypertensive medication ( $P < 0.001$ ), diabetes ( $P < 0.001$ ), and previous myocardial infarction ( $P < 0.028$ ); on mean DBP only known hypertension and antihypertensive medication ( $P < 0.001$ ). In contrast, smoking was associated with lower SBP ( $P < 0.001$ ) and DBP ( $P < 0.05$ ). Alcohol intake once or more per week was associated with higher DBP ( $P < 0.001$ ) compared to no alcohol intake. Pregnancy was associated with lower SBP and DBP ( $P < 0.001$ ). In our case, both alcohol consumption and smoking appear to be reported less frequently than in previous studies.<sup>3</sup>

## Conclusions

This cross-sectional survey in Venezuela allows us to state:

- The proportion of hypertension in Venezuela compared to other MMM reports was higher than the worldwide or American averages.
- Treated hypertensive subjects tend to have higher systolic and diastolic BP than non-treated and non-hypertensive subjects.
- Obesity, previous myocardial infarction, and diabetes mainly influence higher systolic BP.
- One-third of treated hypertensives were not controlled.

## Supplementary material

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

## Acknowledgements

The authors would like to acknowledge, to all individuals who made possible to succeed the MMM18 study in Venezuela. Thanks to FARMATODO, as an institution, who fully collaborated with us, using their pharmacies, equipment, and employees' time to make possible this study and OMRON Healthcare for providing some automated devices.

**Conflict of interest:** none declared.

## References

1. Pan-American Health Organization. Global Status Report on Noncommunicable Diseases 2012. <https://hiss.paho.org/pahosys/grp.php> (October 2018).
2. Anuario de Mortalidad 2013. Ministerio del Poder Popular para la Salud. República Bolivariana de Venezuela. <http://www.ovsalud.org/descargas/publicaciones/documentos-oficiales/Anuario-Mortalidad-2013.pdf> (October 2018).
3. Schargrodsky H, Hernández-Hernández R, Champagne BM, Silva H, Vinuela R, Silva Ayçaguer LC, Touboul P-J, 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.
4. Beaney T, Schutte AE, Tomaszewski M, Ariti C, Burrell LM, Castillo RR, Charchar FJ, Damasceno A, Kruger R, Lackland DT, Nilsson PM, Prabhakaran D, Ramirez AJ, Schlaich MP, Wang J, Weber MA, Poulter NR, Napiza-Granada C, Sevilla MR, Atilano AA, Ona DID, More A, Jose AP, Maheshwari A, Kondal D, Yu W, Li W, Xu S, Yu J, Zhang H, Widyantoro B, Turana Y, Situmorang TD, Sofiatin Y, Barack R, Lin H-J, Wang T-D, Chen W-J, Sirenko Y, Evstigneeva O, Negresku E, Yousif ME, Medani SA, Beheiry HM, Ali IA, Zilberman JM, Marin MJ, Rodriguez PD, Garcia-Vasquez F, Kramoh KE, Ekoua D, Lopez-Jaramillo P, Otero J, Sanchez G, Narvaez C, Accini JL, Hernandez-Hernandez R, Octavio JA, Morr I, Lopez-Rivera J, Ojji D, Arije A, Babatunte A, Wahab KW, Fernandes M, Pereira SV, Valentim M, Dzudie A, Kingue S, Djomou Ngongang DA, Ogola EN, Barasa FA, Gitura B, Malik F-T-N, Choudhury SR, Al Mamun MA, Minh VH, Viet NL, Cao Trung S, Ferri C, Parati G, Torlasco C, Borghi C, Goma FM, Syatalimi C, Zelveian PH, Barbosa E, Sebba Barroso W, Penaherrera E, Jarrin E, Yusufali A, Bazargani N, Tsinamdzgvishvili B, Trapaidze D, Neupane D, Mishra SR, Jozwiak J, Malyszko J, Konradi A, Chazova I, Ishaq M, Memon F, Heagerty AM, Keitley J, Brady AJB, Cockcroft JR, McDonnell BJ, Lanas F, Chia Y-C, Ndhlovu H, Kiss I, Ruilope LM, Ellenga Mbolla BF, Milhailidou AS, Woodiwiss AJ, Perl S, Dolan E, Azevedo V, Garre L, Boggia JG, Lee VVY, Kowlessur S, Miglinas M, Sukackiene D, Wainford RD, Habonimana D, Masupe T, Ortellado J, Wuerzner G, Alcocer L, Burazeri G, Sanchez Delgado E, Lovic D, Mondo CK, Mostafa A, Nadar SK, Valdez Tiburcio O, Leiba A, Dorobantu M, De Backer T, Chifamba J, Stergiou G, Nwokocha CR, Sokolovic S, Toure AI, Connell KL, Khan NA, Burger D, De Carvalho Rodrigues M, Kramer BK, Schmieider RE, Unger T, Wyss FS, Yameogo NV, Beistline H, Kenerson JG, Alfonso B, Olsen MH, Soares M, Poulter NR; MMM Investigators. May Measurement Month 2017: an analysis of blood pressure screening results worldwide. *Lancet Glob Health* 2018;6:e736-e743.
5. Beaney T, Burrell LM, Castillo RR, Charchar FJ, Cro S, Damasceno A, Kruger R, Nilsson PM, Prabhakaran D, Ramirez AJ, Schlaich MP, Schutte AE, Tomaszewski M, Touyz R, Wang J-G, Weber MA, Poulter NR, Burazeri G, Qirjako G, Roshi E, Cunashi R, Fernandes MJCC, Victória Pereira SS, Neto MFMP, Oliveira PNM, Feijão ACG, Cerniello Y, Marin MJ, Garcia Vasquez F, Espeche WG, Stisman D, Fuentes IA, Zilberman JM, Rodriguez P, Babinyan KY, Engibaryan AH, Avagyan AM, Minasyan AA, Gevorkyan AT, Carnagarin R, Carrington MJ, Sharman JE, Lee R, Perl S, Niederl E, Malik F-T-N, Choudhury SR, Al Mamun MA, Ishraqzaman M, Anthony F, Connell K, De Backer TLM, Krzesinski J, Houenassi MD, Houehanou CY, Sokolovic S, Bahtijarevic R, Tiro MB, Mosepele M, Masupe TK, Barroso WS, Gomes MAM, Feitosa ADM, Brandão AA, Miranda RD, Azevedo VMAA, Dias LM, Garcia GDN, Martins IPP, Dzudie A, Kingue S, Djomou FAN, Njume E, Khan N, Lanas FT, Garcia MS, Paccot MF, Torres PI, Li Y, Liu M, Xu L, Li L, Chen X, Deng J, Zhao W, Fu L, Zhou Y, Lopez-Jaramillo P, Otero J, Camacho PA, Accini JL, Sanchez G, Arcos E, M'Buyamba-Kabangu J-R, Katamba FK, Ngoyi GN, Buila NM, Bayauli PM, Ellenga Mbolla BF, Bakekolo PR, Kouala Landa CM, Kimbally Kaky GS, Kramoh EK, Ngoran YNK, Olsen MH, Valdez Valoy L, Santillan M, Angel Rafael GM, Penaherrera CE, Villalba J, Ramirez MI, Arteaga F, Delgado P, Beistline H, Cappuccio FP, Keitley J, Tay T, Goshu DY, Kassie DM, Gebro SA, Pathak A, Denolle T, Tsinamdzgvishvili B, Trapaidze D, Sturua L, Abesadze T, Grdzeldze N, Grabfelder M, Krämer BK, Schmeider RE, Twumasi-Ankrah B, Tannor EK, Lincoln MD, Deku EM, Wyss Quintana FS, Kenerson J, Jean Baptiste ED, Saintilmond WW, Barrientos AL, Peiger B, Lagos AR, Forgas MA, Lee VVY, Tomlinson BWY, Járai Z, Páll D, More A, Maheshwari A, Verma N, Sharma M, Mukherjee TK, Patil M,

- Pulikkottil Jose A, More A, Takalkar A, Turana Y, Widyantoro B, Danny SS, Djono S, Handari SD, Tambunan M, Tiksnadi BB, Hermiawaty E, Tavassoli E, Zolfaghari M, Dolan E, O'Brien E, Borghi C, Ferri C, Torlasco C, Parati G, Nwokocho CR, Nwokocho MI, Ogola EN, Gitura BM, Barasa AL, Barasa FA, Wairagu AW, Nalwa WZ, Najem RN, Abu Alfa AK, Fageh HA, Msalam OM, Derbi HA, Bettamar KA, Zakauskiene U, Vickiene A, Calmes J, Alkerwi A, Gantenbein M, Ndhlovu HLL, Masiye JK, Chirwa ML, Nyirenda NM, Dhlamini TD, Chia YC, Ching SM, Devaraj NK, Ouane N, Fane T, Kowlessur S, Ori B, Heecharan J, Alcocer L, Chavez A, Ruiz G, Espinosa C, Gomez-Alvarez E, Neupane D, Bhattarai H, Ranabhat K, Adhikari TB, Koirala S, Toure IA, Soumana KH, Wahab KW, Omotoso AB, Sani MU, Okubadejo NU, Nadar SK, Al-Riyami HA, Ishaq M, Memon F, Sidique S, Choudhry HA, Khan RA, Ayala M, Maidana AJO, Bogado GGG, Ona DI, Atilano A, Granada C, Bartolome R, Manese L, Mina A, Dumlao MC, Villaruel MC, Gomez L, Józwiak J, Małyszko J, Banach M, Mastej M, de Carvalho Rodrigues MM, Martins LL, Paval A, Dorobantu M, Konradi AO, Chazova IE, Rotar O, Spoares MC, Viegas D, Almustafa BA, Alshurafa SA, Brady A, Bovet P, Viswanathan B, Oladapo OO, Russell JW, Brguljan-Hitij J, Bozic N, Knez J, Dolenc P, Hassan MM, Woodiwiss AJ, Myburgh C, Vally M, Ruilope LM, Molinero A, Rodilla E, Gijón-Conde T, Beheiry HM, Ali IA, Osman AAA, Fahal NAW, Osman HA, Altahir F, Persson M, Wuerzner G, Burkard T, Wang T-D, Lin H-J, Pan H-Y, Chen W-J, Lin E, Mondo CK, Ingabire PM, Khomazyuk TT, Krotova VV-Y, Negresku E, Evstigneeva O, Bazargani NN, Agrawal A, Bin Belaila BA, Suhail AM, Muhammed KO, Shuri HH, Wainford RD, Levy PD, Boggia JJ, Garré LL, Hernandez-Hernandez R, Octavio-Seijas JA, Lopez-Rivera JA, Morr I, Duin A, Huynh MV, Cao ST, Nguyen VL, To M, Phan HN, Cockcroft J, McDonnell B, Goma FM, Syatalimi C, Chifamba J, Gwini R, Tiburcio OV, Xia X; the MMM Investigators. May Measurement Month 2018: a pragmatic global screening campaign to raise awareness of blood pressure by the International Society of Hypertension. *Eur Heart J* 2019;**40**:2006-2017.
6. 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, Ruiz-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**(Suppl D):D124-D126.
  7. Carballo-Arias Y. Occupational safety and health in Venezuela. *Ann Glob Health* 2015;**81**:512-521.
  8. The Lancet. Lancet editorial: Venezuelans' right to health crumbles amid political crisis. *Lancet* 2019;**393**:1177.