

May Measurement Month 2018: an analysis of blood pressure screening results from Brazil

Eduardo Barbosa^{1*}, Bruna Eibel^{1,2}, Audes D.M. Feitosa³, Andréa A. Brandão⁴, Luiz A. Bortolotto⁵, Mario F.T. Neves⁶, José F.V. Martin⁷, Antonio C.S. Spinelli⁸, Elizabeth E.S. Cestário⁹, Erika M.G. Campana¹⁰, Juan C.Y. Toledo⁷, Rui M.S. Póvoa¹¹, Thomas Beaney^{12,13}, Anca Chis Ster¹², Neil R. Poulter¹², Marco A. Mota-Gomes¹⁴, and Weimar Kunz Sebba Barroso¹⁵

¹Hypertension League, Porto Alegre, Brazil;

²Post Graduation Program IC/FUC, Porto Alegre, Brazil;

³Laboratory of Immunopathology Keizo Asami, Federal University of Pernambuco, Recife, Brazil;

⁴State University of Rio de Janeiro, Rio de Janeiro, Brazil;

⁵InstitUto do Coração - InCor - HC FMUSP, Brazil;

⁶Department of Clinical Medicine State, University of Rio de Janeiro, Rio de Janeiro, Brazil;

⁷Faculdade de Medicina de São José do Rio Preto (FAMERP), São Paulo, Brazil;

⁸Cardiocentro, Natal, Brazil;

⁹Centro Universitário de Votuporanga, Votuporanga, Brazil;

¹⁰Universidade Nova Iguacu (UNIG), Nova Iguacu, Rio de Janeiro, Brazil;

¹¹Universidade Federal de São Paulo, São Paulo, Brazil;

¹²Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London W12 7RH, UK;

¹³Department of Primary Care and Public Health, Imperial College London, St Dunstan's Road, London W6 8RP, UK;

¹⁴Department of Cardiology, CESMAC/Uncisal, Hospital do Coração de Alagoas, Maceió, Brazil; and

¹⁵Hypertension League, Federal University of Goiás, Goiás, Brazil

KEYWORDS

MMM18;

Hypertension;

Brazil

Hypertension is a pathology of high prevalence in the world. In Brazil, it is the main risk factor for the major cause of death in the country, coronary heart disease. The May Measurement Month Campaign in 2018 (MMM18) included a population with representation from all Brazilian states and reflects some of the characteristics of hypertension in Brazil. Questionnaire data were collected and three measures of blood pressure (BP) were performed. The sample consisted of 12 413 individuals, 59.1% were white, 51.3% were women. The average age was $54. \pm 16.0$ years. Diabetes was present in 11.6%, previous myocardial infarction in 5.9%, and previous stroke in 2.7%. Current smokers were 9.3% and 12.4% were regular drinkers. The average body mass index was 27.3 ± 4.5 kg/m². After multiple imputations, 67.9% were hypertensive (>140/90 mmHg). Of the individuals who were not taking antihypertensive medication, 27.9% were hypertensive and of those taking antihypertensive medication, 40.3% were uncontrolled. Systolic BP increased with age. The MMM18 campaign demonstrated a large number of unknown hypertensives and a high rate of uncontrolled hypertension in Brazil, unfortunately in keeping with 2017 findings.

*Corresponding author. Tel: +55 51999623946, Email: edubarbosa@terra.com.br

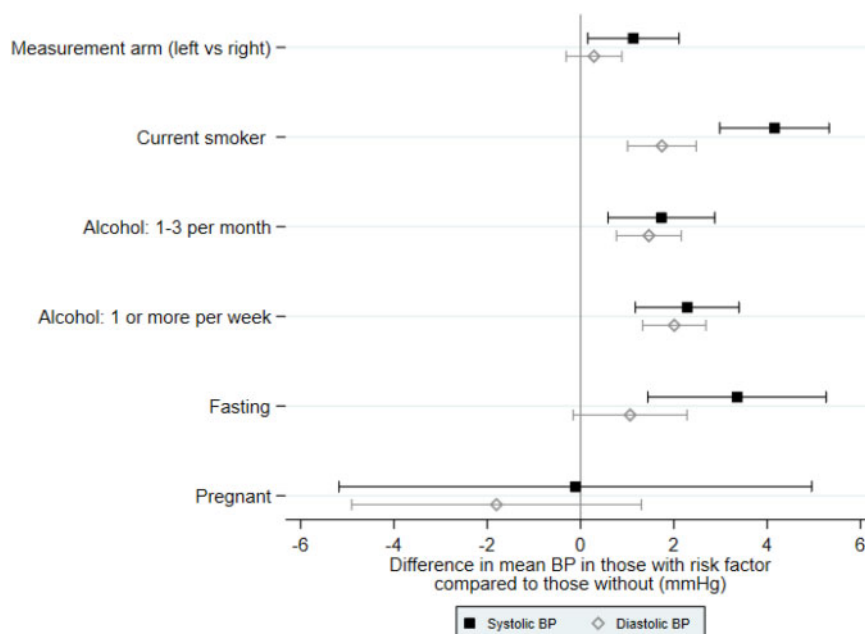


Figure 1 Difference in mean blood pressure in those with each characteristic compared to those without from linear regression models adjusted for age, sex, and antihypertensive medication (pregnancy adjusted for age and antihypertensive medication alone).

Introduction

May Measurement Month (MMM) is a global initiative aimed at raising awareness of high blood pressure (BP) and to act as a temporary solution to the lack of screening programmes worldwide.¹ Measurement of BP is a cheap, simple, and non-invasive technique to detect hypertension and, assuming effective therapy is supplied, leads to highly cost-effective protection against death and disability^{2,3} which otherwise usually arises from myocardial infarction, cerebrovascular disease, and renal failure.¹

Cardiovascular disease (CVD), mainly stroke and coronary heart disease, has been Brazil's leading cause of death for half a century. Coronary heart disease, now the leading cause of CVD death, accounted for 31% of CVD mortality, cerebrovascular diseases for 30%, hypertensive heart disease for 14%, and other forms of heart disease (mainly congestive heart failure) for 18%.⁴ Thereby, our country got involved with MMM initiative to verify our current status about this considerable health epidemic.

The primary objective was to raise awareness of BP.

Methods

An opportunistic cross-sectional survey of volunteers aged ≥ 18 was carried out in May 2018. BP measurement, the definition of hypertension, and statistical analysis followed the standard MMM protocol.⁵ All the main regions of Brazil were included, providing us with representation from the whole country. Each participant had three seated BP measurements and the mean of readings 2 and 3 was calculated for the analysis. We measured the number of people screened by Brazilian state, and the number of people who have untreated or inadequately treated hypertension

(defined as systolic BP ≥ 140 mmHg or diastolic ≥ 90 mmHg, or both, based on the mean of the second and third BP readings). Where either reading was missing, multiple imputation was performed based on the global data¹ to impute the missing reading. We considered overweight if body mass index (BMI) was ≥ 25 , and obesity if BMI was ≥ 30 .

All ethical precepts have been respected. Data were collected by the centres in spreadsheets and analysed centrally by the MMM18 project team steering committee, according to the standard analysis plan.¹

Results

The most common types of screening sites were hospitals and indexed clinics. During MMM18, 12 413 individuals from different ethnicities were screened of which there were 7337 (59.1%) white participants, 1232 (9.9%) black, and 40% others. The majority were female (6368, 51.3%) and the mean age was 54.5 ± 16.0 years. Blood pressure measurement was obtained by automatic Omron devices, on either the right (1993, 16.1%) or the left (6565, 52.9%) arm (3855, 31.1%) unknown. Reported rates of relevant comorbidities were diabetes in 11.6% (1435), previous myocardial infarction in 5.9% (730), and previous stroke in 2.7% (339). Current smokers were 1160 individuals (9.3%) and 1535 (12.4%) reported alcohol intake once or more per week. The mean BMI was 27.3 ± 4.5 kg/m², with 3170 (25.5%) in the overweight range and 1816 (14.6%) in the obese range.

After imputation 8435 participants (67.9%) were hypertensive (systolic BP ≥ 140 mmHg or diastolic ≥ 90 mmHg or on BP-lowering therapy). Of individuals not receiving antihypertensive medication, 1540 (27.9%) were hypertensive. Of individuals receiving antihypertensive medication, 2777 (40.3%) had uncontrolled BP. Of those who were

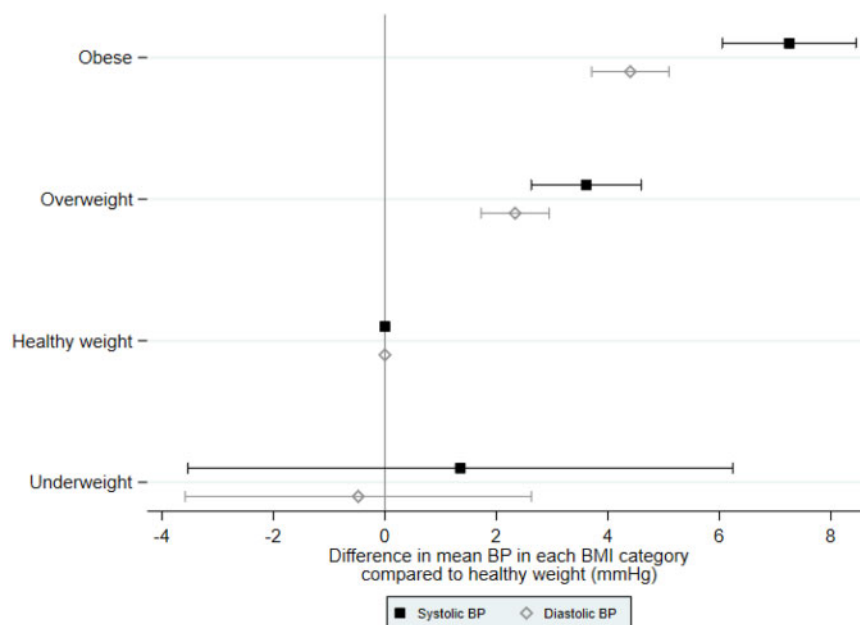


Figure 2 Difference in mean blood pressure according to body mass index from linear regression models, adjusted for age, sex, and antihypertensive medication, with healthy weight as the reference category.

hypertensive, 7122 (84.4%) were aware of their diagnosis and 6895 (81.7%) were on medication, of whom 4118 (59.7%) were controlled.

Based on linear regression models adjusting for age and sex (with an interaction) and antihypertensive treatment, smokers vs. non-smokers were associated with higher levels of BP (Figure 1). Similarly, participants who drank once or more per week or 1-3 times per month vs. those who drank never/rarely were associated with higher levels of BP (Figure 1). In the analysis of the difference in mean BP according to BMI from linear regression models with healthy weight as the reference category, obese and overweight individuals showed significantly higher systolic and diastolic BP (Figure 2).

Discussion

MMM18 is the largest synchronized, standardized, multinational screening campaign of any cardiovascular risk factor ever done in Brazil. Pending the establishment of BP surveillance systems around the world, this inexpensive annual screening campaign could help offset the enormous health burden attributed to increased BP.¹ The MMM18 results may provide an opportunity for a paradigm shift in the Brazilian lifestyle, with more awareness about high BP and the associated risks.

The proportion of hypertensives, treated and controlled (to <140/90) presented in this article, is in line with data published in a prospective cohort⁶ that showed that systolic BP increases over the years. This is likely due to the risk factors we are constantly exposed to, including stress, poor diet, sedentary lifestyle, smoking, and others.³ Unfortunately this is in keeping with the 2017 findings.⁷

In conclusion, MMM18 was the largest BP screening campaign undertaken in Brazil. The proportion of hypertension

in Brazil (67.9%) was higher than that in the Americans (40.4%) and in the global data (33.4%), however, Brazil showed higher levels of awareness (84.4%) than Americans and global figures (76.7% and 59.5%, respectively). The high percentage of newly diagnosed hypertension and the identification of uncontrolled hypertension despite pharmacologic treatment reinforce the importance of this annual event in Brazil to raise awareness, and to improve the prevention of major adverse cardiovascular events. These results suggest that opportunistic screening can identify a significant number of individuals with raised BP, both off and on treatment.

Acknowledgements

The authors would like to thank all local investigators, volunteers, and the Department of Hypertension from Brazilian Society Cardiology to support the campaign.

Funding

This work was supported by the Servier Brazil and Omron.

Conflict of interest: none declared.

References

1. 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; MMM Investigators. May Measurement Month 2017: an analysis of blood pressure screening results worldwide. *Lancet Glob Health* 2018; 6:e736-e743.
2. Turnbull F, Woodward M, Neal B, Barzi F, Ninomiya T, Chalmers J, Perkovic V, Li N, MacMahon S; the Blood Pressure Lowering Treatment Trialists' Collaboration. Do men and women respond differently to blood pressure lowering treatment? Results of prospectively designed overviews of randomized trials. *Eur Heart J* 2008;29:2669-2680.

3. Olsen MH, Angell SY, Asma S, Boutouyrie P, Burger D, Chirinos JA, Damasceno A, Delles C, Gimenez-Roqueplo A-P, Hering D, López-Jaramillo P, Martinez F, Perkovic V, Rietzschel ER, Schillaci G, Schutte AE, Scuteri A, Sharman JE, Wachtell K, Wang JG. A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. *Lancet* 2016;**388**:2665-2712.
4. Ribeiro ALP, Duncan BB, Brant LCC, Lotufo PA, Mill JG, Barreto SM. Cardiovascular health in Brazil: trends and perspectives. *Circulation* 2016;**133**:422-433.
5. Poulter NR, Borghi C, Castillo RR, Charchar FJ, Ramirez AJ, Schlaich MP, Schutte AE, Stergiou G, Unger T, Wainford RD, Beaney T. May Measurement Month 2017: results of 39 national blood pressure screening programmes. *Eur Heart J Suppl* 2019;**21**(Suppl D):D1-D4.
6. Forouzanfar MH, Liu P, Roth GA, Ng M, Biryukov S, Marczak L, Alexander L, Estep K, Hassen Abate K, Akinyemiju TF, Ali R, Alvis-Guzman N, Azzopardi P, Banerjee A, Barnighausen T, Basu A, Bekele T, Bennett DA, Biadgilign S, Catalá-López F, Feigin VL, Fernandes JC, Fischer F, Gebru AA, Gona P, Gupta R, Hankey GJ, Jonas JB, Judd SE, Khang Y-H, Khosravi A, Kim YJ, Kimokoti RW, Kokubo Y, Kolte D, Lopez A, Lotufo PA, Malekzadeh R, Melaku YA, Mensah GA, Misganaw A, Mokdad AH, Moran AE, Nawaz H, Neal B, Ngalesoni FN, Ohkubo T, Pourmalek F, Rafay A, Rai RK, Rojas-Rueda D, Sampson UK, Santos IS, Sawhney M, Schutte AE, Sepanlou SG, Shifa GT, Shiue I, Tedla BA, Thrift AG, Tonelli M, Truelsen T, Tsilimparis N, Ukwaja KN, Uthman OA, Vasankari T, Venketasubramanian N, Vlassov VV, Vos T, Westerman R, Yan LL, Yano Y, Yonemoto N, Zaki MES, Murray CJL. Global burden of hypertension and systolic blood pressure of at least 110 to 115 mm Hg, 1990-2015. *JAMA* 2017;**317**:165-182.
7. Barbosa E, Eibel B, Brandão AA, Feitosa ADM, Miranda RD, Kobeissi E, Beaney T, Poulter NR, Mota-Gomes MA, Barroso WKS. May Measurement Month 2017: Brazilian results—Americas. *Eur Heart J Suppl* 2019;**21**(Suppl D):D25-D27.