



European Society
of Cardiology

MMM17-Cameroon, analysis and opportunities— Sub-Saharan Africa

Anastase Dzudie^{1,2*}, Armel Djomou³, Hamadou Ba¹, Epie Njume²,
Marie Solange Ndom¹, Liliane Kuate Mfekeu¹, Sylvie Ndongo¹,
Charles Kouam Kouam¹, Alexis Awungia¹, Stephane Ze¹, Alain Menanga¹,
Andre Pascal Kengne², Xin Xia⁴, Thomas Beaney⁴, Neil R. Poulter⁴, and
Samuel Kingue¹, On behalf of the Cameroon Cardiac Society and MMM
Cameroon Investigator Group

¹Cameroon Cardiac Society, Cameroon;

²Clinical Research Education, Networking and Consultancy, Douala, Cameroon;

³Fondation Coeur et Vie, Douala, Cameroon; and

⁴Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London W12 7RH, UK

Elevated blood pressure (BP) is a growing burden worldwide, leading to over 10 million deaths each year. May Measurement Month (MMM) is a global initiative aimed at raising awareness on high BP and temporary increasing screening for hypertension worldwide. We here provide the results of the 2017 MMM (MMM17) edition in Cameroon. An opportunistic cross-sectional survey of volunteers aged ≥ 18 was carried out in May 2017 nationwide. BP measurement, the definition of hypertension and statistical analysis followed the standard MMM protocol. The campaign was advertised through various media and screening stations were set-up in local markets, churches, and outpatient departments of health facilities. In all, 16 093 individuals were screened during MMM17, of whom 4595 (29.2%) had hypertension. A total of 2742 (19.8%) of individuals not receiving anti-hypertensive medication were found to be hypertensive. Of those on medication, 1048 (57.2%) had uncontrolled BP. After adjusting for age, sex, and use of BP lowering medications, systolic and diastolic BPs were significantly higher in people on anti-hypertensive treatment, with higher waist circumference. MMM17 was the largest BP screening campaign undertaken in Cameroon, and although treatment and control rates are higher than previously reported, they are still well below optimum levels. MMM has highlighted the need for routine population-based surveys and suggests that opportunistic screening can identify significant numbers with raised BP.

Introduction

In Sub-Saharan Africa (SSA), stroke and heart disease are the leading cause of death from Cardiovascular disease (CVD),¹⁻³ and raised blood pressure (BP) is a major driver of these CVD-related deaths.⁴

Hypertension affects about 130.2 million individuals in Africa and is projected to reach 216.8 million by 2030.⁵ In Cameroon, the prevalence of hypertension is estimated to

be 24% to 41% in urban communities.⁶⁻⁸ Awareness rates as low as 14% have been reported,⁸ especially in rural areas where access to information is limited and contact with healthcare professionals is low. Among known hypertensives, control rates are very poor, ranging from 2 to 34%.^{6,8,9}

Strategies are therefore needed to increase the awareness, prevention, detection, treatment, and control of hypertension in SSA in general including Cameroon. The World Hypertension Day-2017 was extended to a month and became the May Measurement Month (MMM), introduced by the International Society of Hypertension (ISH). This is a

*Corresponding author. Tel: +237 679617981, Email: aitzudie@yahoo.com; anastase.dzudie@crenc.org

global campaign aimed at 'highlighting the importance of measuring BP, and to identify and reduce the BPs of over 2 million people who require intervention according to current guidelines'. One of the key objectives of MMM17 was to use the data on untreated hypertension to urge governments to improve local screening.¹⁰

We here summarize findings from MMM17 in Cameroon.

Methods

The broad design, aims, and specific methods underlying the MMM study, have been described in detail previously.¹¹ MMM in Cameroon was co-ordinated by the Cameroon Cardiac Society (CCS), the Clinical Research Education, Networking and Consultancy (CRENC), a not for profit research organization, and Fondation Coeur et Vie (FoCev). The CRENC was responsible for obtaining ethical clearance from the National Ethical Committee and data management and transfer to the ISH team while the CCS and the FoCev joined in for field screening and data collection.

The campaign was promoted nationally through classical and social media, churches, and markets by the CCS and endorsed by the Ministry of Public Health. In each of the 10 regions of Cameroon, leaders were identified and were responsible for screening and recruiting volunteer staff to set-up screening sites. More than 40 sites were created in rural, semi-urban and urban settings, and volunteers were trained on the techniques of measurement and data entry. Height and weight were measured and ideally three BP measurements were made using automated or manual devices depending on which were available. Hypertension was defined as a systolic BP ≥ 140 or diastolic BP ≥ 90 mmHg and/or in those on anti-hypertensive treatment.

Data were collected on hard copy forms, over 30 days, and entered on Microsoft Excel sheets. Data were cleaned locally by the CRENC and sent to the MMM project team for further cleaning and analyses. A full description of the statistical analysis is available elsewhere.¹¹

Results

Of the 16 093 participants screened, 9323 (57.9%) were female and 29 (0.3%) reported to be pregnant. The mean SD age was 41.7 (15.2) years and 99.4% were black. With regards to self-reported conditions and risk factors, 205 (1.3%) had a history of myocardial infarction and previous stroke, 1853 (11.5%) were on anti-hypertensive medications, 673 (4.2%) had diabetes, and 792 (4.9%) were current smokers, while 7523 (46.8%) consumed alcohol once or more per week.

Of the 8090 participants for whom waist circumference was measured, 2584 (16.1%) had desirable values (i.e. < 90 cm in men and < 80 cm in women). The mean BMI in 12 886 participants was 27.3 (SD: 5.2) kg/m². Among the 15 084 participants for whom a BP measurement arm was indicated, 12 087 measurements were done on the left arm. Measurements done on different days of the week peaked on Wednesdays and were lowest on Sundays.

Among the 11 382 participants with three valid consecutive BP measurements, the 1st readings (both SBP and DBP)

were the highest and the 3rd reading the lowest, while the average of the 2nd and 3rd readings was not appreciably different from the 2nd reading. After imputation of missing BP data¹¹ 4595 (29.2%) had hypertension. Of those not receiving treatment, 2742 (19.8%) were found to have hypertension and of those on anti-hypertensive treatment, 1048 (57.2%) had uncontrolled BP. Crude age- and sex-standardized means BP levels before and after missing data imputation are shown in *Table S1* (see Supplementary data).

In linear regression models adjusted for age, sex, and use of BP lowering medications, systolic and diastolic BPs were significantly higher in people on anti-hypertensive treatment those with higher waist circumference, and lower in pregnant women (see Supplementary material online, *Figure S1*). Furthermore, SBP (but not DBP) was higher in participants with diabetes ($P < 0.0001$) (see Supplementary material online, *Table S2*). In regression models with similar levels of adjustment and including the interaction term of gender and age, and using underweight as a reference, SBP and DBP steadily increased across increasing BMI categories (i.e. normal weight, overweight and obese) (see Supplementary material online, *Figure S2*).

Discussion

The MMM17 is the largest co-ordinated BP screening globally and in Cameroon. Of the 16 093 participants screened in Cameroon, nearly a third had hypertension, and about one in five not on treatment were found to have hypertension. Among those receiving BP lowering medication, nearly three in five were not at target BP control levels. The proportion of hypertension in the Cameroon arm of MMM17 is slightly lower than the global MMM17 average of 34.9%,¹¹ but within the range of reports from a nationwide survey in Cameroon⁷ and recent meta-analyses of hypertension prevalence across Africa.¹² However, it is slightly higher than 24.6% reported by Kamadjeu *et al.*⁶ in 2006, and much lower than 47.5% reported by Dzudie *et al.*¹³ in 2012. The 47.5% prevalence reported by Dzudie *et al.* in 2012 is likely to be overestimated due to the smaller sample of 2120 self-selected and urban dwellers. Indeed, a higher prevalence of hypertension than that reported by Kamadjeu *et al.* reflects an increase over time as previously reported in urban and rural Cameroon.¹⁴

Treatment and control rates in MMM17 Cameroon, which are similar to the global MMM17 averages, are the highest ever reported in Cameroon. This may reflect differential sampling techniques, a more accurate estimate compared with previous reports or perhaps progress following national efforts to address this global public health challenge.

MMM17 has reinvigorated the awareness on the alarming burden of hypertension in Cameroon and the need for more efforts into health promotion, detection, and effective management of people with the condition, in order to limit the devastating health impact. For this to be effective, there is a critical need for capacity building among primary healthcare personnel to be able to effectively diagnose and manage hypertension. The country currently has less

than a 100 cardiologists, internists, and nephrologists who are essentially based in major urban centres. MMM17 also highlights the need for more routine, extensive, low-cost population-based surveys using standardized methodology not only to facilitate comparison between countries and regions but also to transfer best practices ('best buys') to address the rising burden of hypertension. PASCAR has taken the lead with its 10-point urgent action plan—'roadmap to achieve 25% hypertension control in Africa by 2025'.¹⁰ The Cameroon ministry of public health and hopefully, other African countries is expected to adopt this programme which has been tailored to ensure a reduction of the burden of hypertension on the continent.

Supplementary material

Supplementary material is available at *European Heart Journal - Supplements* online.

Acknowledgements

We are grateful to all MMM17 Cameroon volunteers, all Cameroon cardiologists, all doctors and staff from the CRENC and the FoCev, all the participants, the Cameroon Ministry of Public Health and all other partners who supported this project in Cameroon.

List of collaborators

Clovis Nkoke^{1,2}, Nelson Sontsa², Chris Nadege Nganou¹, Jerome Boombhi¹, Felicite Kamdem¹, Joseph Abah¹, Herve Meli¹, Yves Monkam¹, Christian Biholong¹, Ambang Serah¹, Cabral Tantchou¹, Jules Ndjebet¹, Pierre Mintom¹, Jean Paul Doualla Mouandjo¹, Sidick Aboubakar Mouliom¹, and Manon Ebene¹

¹Cameroon Cardiac Society, Cameroon; ²Clinical Research Education, Networking and Consultancy, Douala, Cameroon; and ³Fondation Coeur et Vie, Douala, Cameroon

We very much appreciate your kind and sincere collaboration.

Conflict of interest: none declared.

References

1. WHO. Noncommunicable diseases country profiles 2018 [Internet]. WHO. <http://www.who.int/nmh/countries/en/> (22 October 2018).
2. WHO. Disease and injury country estimates [Internet]. WHO. https://www.who.int/healthinfo/global_burden_disease/estimates_country/en/ (22 October 2018).
3. Mbewu A. The burden of cardiovascular disease in sub-Saharan Africa: burden of cardiovascular disease. *SA Heart* 2009;6:4-10.
4. Gillum RF. The burden of cardiovascular disease in Sub-Saharan Africa and the black diaspora. *J Racial Ethn Health Disparities* 2018; 5:1155-1158.
5. Adeloje D, Basquill C. Estimating the prevalence and awareness rates of hypertension in Africa: a systematic analysis. *PLoS One* 2014;9:e104300.
6. Kamadjeu RM, Edwards R, Atanga JS, Unwin N, Kiawi EC, Mbanya JC. Prevalence, awareness and management of hypertension in Cameroon: findings of the 2003 Cameroon Burden of Diabetes Baseline Survey. *J Hum Hypertens* 2006;20:91-92.
7. Kingue S, Ngoe CN, Menanga AP, Jingi AM, Noubiap JJ, Fesuh B, Nouedoui C, Andze G, Muna WF. Prevalence and risk factors of hypertension in urban areas of Cameroon: a nationwide population-based cross-sectional study. *J Clin Hypertens* 2015;17:819-824
8. Lemogoum D, Van de Borne P, Lele CEB, Damasceno A, Ngatchou W, Amta P, Leeman M, Preumont N, Degaute J-P, Kamdem F, Hermans MP, Donnem P, Bovet P. Prevalence, awareness, treatment, and control of hypertension among rural and urban dwellers of the Far North Region of Cameroon. *J Hypertens* 2018;36:159-168.
9. Arrey WT, Dimala CA, Atashili J, Mbuagbaw J, Monekosso GL. Hypertension, an emerging problem in rural Cameroon: prevalence, risk factors, and control. *Int J Hypertens* 2016;2016:5639146.
10. Dzudie A, Rayner B, Ojji D, Schutte AE, Twagirumukiza M, Damasceno A, Ba SA, Kane A, Kramoh E, Kacou JB, Onwubere B. Roadmap to achieve 25% hypertension control in Africa by 2025. *Glob Heart* 2018;13:45-59.
11. 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.
12. Ataklte F, Erqou S, Kaptoge S, Taye B, Echouffo-Tcheugui JB, Kengne AP. Burden of undiagnosed hypertension in sub-saharan Africa: a systematic review and meta-analysis. *Hypertension* 2015;65:291-298.
13. Dzudie A, Kengne AP, Muna WFT, Ba H, Menanga A, Kouam Kouam C, Abah J, Monkam Y, Biholong C, Mintom P, Kamdem F, Djomou A, Ndjebet J, Wambo C, Luma H, Ngu KB, Kingue S. Prevalence, awareness, treatment and control of hypertension in a self-selected sub-Saharan African urban population: a cross-sectional study. *BMJ Open* 2012;2:e001217.
14. Fezeu L, Kengne AP, Balkau B, Awah PK, Mbanya JC. Ten-year change in blood pressure levels and prevalence of hypertension in urban and rural Cameroon. *J Epidemiol Community Health* 2010;64:360-365.