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## May Measurement Month 2019: an analysis of blood pressure screening results from Cameroon

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### KEYWORDS

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Control

The multi-country May Measurement Month (MMM) screening campaign aims to raise awareness on blood pressure (BP) and hypertension in individuals and communities, and measure BP, ideally, of those who had no BP measurement in the preceding year. We here report key findings from the Cameroon arm of MMM 2019. An opportunistic sample of adults ( $\geq 18$  years) was included from 5 May to 5 June 2019 across 15 sites (markets, churches, homes, motor parks, workplaces, and hospitals/clinics). Data collection, cleaning, the definition of hypertension, and statistical analysis followed the standard protocol. The mean age of the 30 187 participants screened was 36.9 (SD: 14.9) years, 50.4% were female (5% of whom were pregnant), and 94.4% were screened out of the hospital/clinic settings. After multiple imputation of missing data, 6286 (20.8%) had hypertension, 24.0% were taking antihypertensive medication, and 705 (11.2%) of all participants with hypertension had controlled BP. In linear regression models adjusted for age, sex, and antihypertensive medicines use, a previous diagnosis of hypertension, a history of stroke, and use of antihypertensive medicines were significant predictors of systolic and diastolic BP levels. BPs were also significantly higher when measured in public outdoors, public indoors (diastolic BP only), workplaces, and other unspecified areas compared to hospitals/clinic settings. MMM19 is the largest ever BP screening campaign in a single month, in Cameroon and despite the limitations resulting from non-random sample selection,

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the opportunistic screening allows access to awareness and screening for hypertension out of the hospital/clinic settings.

## Introduction

Hypertension is the most common cardiovascular risk factor and a major cause of premature death.<sup>1,2</sup> In 2010, an estimated 1.39 billion adults had hypertension, worldwide, with projections that figures will exceed 1.5 billion by 2025.<sup>1-4</sup> The African Region of the World Health Organization (WHO) has the highest prevalence estimates for hypertension, which affects about 46% of adults aged 25 years and older, and with a rising trend in prevalence.<sup>4</sup> Hypertension is by far the commonest underlying risk factor for stroke, kidney, and heart disease in sub-Saharan (SSA). As a consequence, in 2017, the Pan African Society of Cardiology (PASCAR) urged SSA countries to define or adopt a clear hypertension policy, in order to reduce heart disease and stroke on the continent.<sup>5</sup>

In Cameroon, a recent systematic review and meta-analysis of population-based studies, involving 469 491 adults aged 18 years and above, reported an overall hypertension prevalence of 30.9%, coupled with declining awareness (from 24.4-31.6% between 1994-2010 to 20.8% between 2011-2018) and control rates (8.8-10.4% between 1994-2010 and 8.3% between 2011-2018), and only 15.1% of those with hypertension taking blood pressure (BP) lowering medicines.<sup>6</sup> Despite the low awareness, treatment, control rates, and rising burden of hypertension in Cameroon, opportunities for screening, implementing lifestyle interventions are limited. Thus, the May Measurement Month (MMM) campaign presents a unique opportunity to fill this gap. The MMM campaigns in 2017 and 2018 screened 16 093 and 8883 participants respectively in Cameroon. The 2018 campaign showed higher systolic and diastolic BP among participants previously diagnosed with hypertension, participants on anti-hypertensive medication and those who reported alcohol intake at least once per week. Also, systolic BP and diastolic BP increased consistently with increasing body mass index.<sup>3</sup> We report here the key findings from MMM 2019 in Cameroon.

## Methods

The broad design and specific approach of the MMM in Cameroon have been presented previously.<sup>7</sup> The screening was coordinated by the Cameroon Cardiac Society (CCS) in collaboration with the Clinical Research Education, Networking and Consultancy (CRENC), a not-for-profit research organization and Fondation Coeur et Vie (FoCev). CCS provided the funding, while the CRENC and FoCev coordinated the screening operations including: the training of volunteers, distribution of equipment, and supervision. There were over 40 volunteers who were either members or affiliates of CRENC and FoCev. They were trained on how to recruit participants, proper BP measurement techniques

using manual and automated devices, data collection and submission using the MMM19 App, or collection on paper forms and entry onto Microsoft Excel sheets. The campaign was promoted using traditional and social media.

Between 5 May and 5 June 2019, screening was conducted at 15 of 29 sites which were given unique identification numbers. Screening locations included: homes, public arenas, markets, churches, social groups, and workplaces. Height and weight were measured or estimated if measurement was not feasible. Three BP measurements were taken successively on each participant, in a sitting position using upper-arm Omron BP devices donated to ISH by (Omron Healthcare, Kyoto, Japan) in 85% of readings. Otherwise, locally available automated devices were used to measure BP. Hypertension was defined as systolic BP  $\geq 140$  mmHg and/or diastolic BP  $\geq 90$  mmHg or taking antihypertensive medicines.

Data were collected using the MMM 2019 Data Capture Form on the App and on hard copy forms. The App enabled data to be submitted to the MMM Project Team in real-time while data collected on paper forms were cleaned by the CRENC Team and entered on Excel 2019 spreadsheets and sent to the MMM Project Team for further cleaning and analysis. Where second or third BP readings were unavailable, multiple imputation was implemented to estimate the mean BP. A complete description of the statistical analysis has been published previously.<sup>7</sup>

## Results

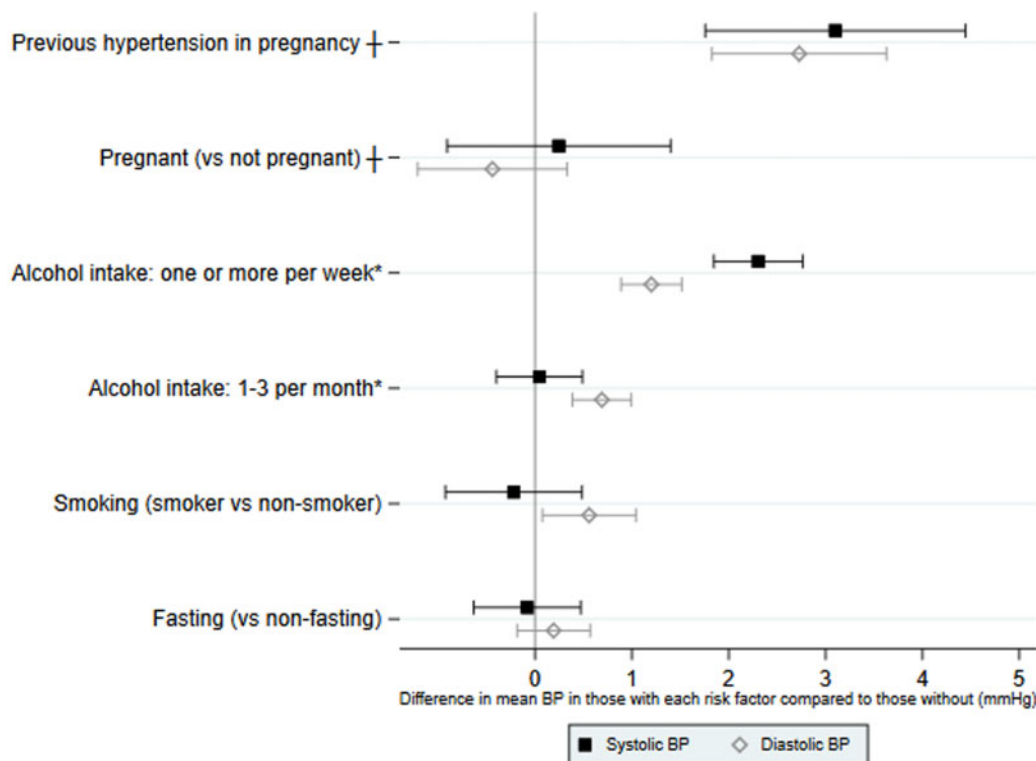
The mean age of the 30 187 participants screened was 36.9 (SD: 14.9), 14 938 (49.5%) were male, 29 308 (97.1%) were Black, 62 (0.2%) were White, 30 (0.1%) were of mixed races, and 768 (5.0%) were pregnant. The vast majority (94.4%) of the participants were screened out of the hospital/clinic setting and 3754 (12.4%) were in a fasting state, defined as having had the last meal at least 8 h before the screening. More than two-thirds (71.2%) were not screened in MMM2017/2018, while 34.3% had their last BP measurement more than 12 months ago, and 22.6% had never had their BP measured. Diabetes, previous myocardial infarction, and previous stroke were reported by 2.9%, 1.0%, and 0.5%, respectively. Also, 1.2% were taking aspirin and 0.5% were on a statin. Of the 14 577 females, 4.3% reported being hypertensive in a previous pregnancy.

After multiple imputation, of all participants, 6286 (20.8%) had hypertension, 24.0% of whom were taking anti-hypertensive medication and only 705 (11.2%) had controlled BP ( $< 140/90$  mmHg), as shown in *Table 1*.

Of those not taking antihypertensive medication, 4776 (16.7%) had hypertension, giving a total of 5581 (18.5%) participants overall with untreated and/or inadequately controlled hypertension.

**Table 1** Total participants and proportions with hypertension, awareness, on medication, and with controlled BP

Total participants	Number (%) with hypertension	Number (%) of hypertensives aware	Number (%) of hypertensives on medication	Number (%) of those on medication with controlled BP	Number (%) of all hypertensives with controlled BP
30 187	6286 (20.8%)	1882 (29.9%)	1510 (24.0%)	705 (46.7%)	705 (11.2%)



**Figure 1** Differences in mean systolic and diastolic blood pressure (with 95% confidence interval) in those with each risk factor compared to those without, from linear mixed models adjusted for age, sex and antihypertensive medication. <sup>a</sup>Compared to ‘never/rarely’ at baseline. <sup>b</sup>Pregnancy adjusted for age and antihypertensive medication alone.

In linear mixed models, mean systolic and diastolic BP in males, but only mean diastolic BP in females, showed an inverted U relationship with age. Mean diastolic BP in males and females peaked at 50 years, while systolic BP peaked in males at 55-60 years, followed by a slow decline with further increase in age. Mean systolic BP in females showed an almost linear relationship with age. Also, mean diastolic BP was higher in males than in females at all ages, while mean systolic BP was higher in males up to the ages 75-80 years.

After adjustment for age, sex, and use of antihypertensive medicines, systolic and diastolic BPs were higher in participants with a previous diagnosis of hypertension and a history of stroke, and in those who reported taking antihypertensive medicines. Systolic BP and diastolic BP were significantly higher in women who reported having a previous hypertension in pregnancy, than in those without a history of hypertension in pregnancy. There was no significant difference in mean BPs between women who reported being pregnant and those who were not. Participants who

consumed alcohol one or more times per week had significantly higher systolic and diastolic BPs compared to those who never/rarely consumed alcohol (Figure 1). BPs were significantly higher when measured in public outdoors, public indoors (diastolic BP only), workplaces, and other unspecified areas compared to hospitals/clinic settings. In contrast, there was no difference between the BPs measured in pharmacies and hospitals/clinic settings.

### Discussion

MMM19 is the third edition of the global BP screening in the month of May, and the largest ever BP screening campaign in a single month in Cameroon, with over 30 000 participants screened. This is more than the number of participants in MMM17<sup>8</sup> and MMM18, in Cameroon, combined. One-fifth of the participants had hypertension, about one-third of whom were aware and a quarter of whom were on antihypertensive treatment. Of all those

with hypertension on treatment, fewer than half were controlled and just a little above one-tenth of all participants with hypertension were controlled. These findings are very similar to those reported in MMM18 except for the proportion of participants with hypertension on treatment which is somewhat lower,<sup>3</sup> but higher than from the rate in MMM17.<sup>8</sup> The proportion of participants with hypertension is much lower while levels of awareness, treatment, and control rates are higher than reports from a systematic review and meta-analysis of population-based studies by Kuate Defo *et al.*<sup>6</sup> The disparity between the MMM19 results and previous studies may be indicative of the impact of other *ad hoc* BP screening campaigns typically organized in commemoration of events, including, but not limited to World Hypertension Day, World Heart Day, World Diabetes Day. These events are typically smaller than the MMM campaigns in scope and depth but may have far-reaching effects. Also, given the preventative nature of the MMM, the impact of previous campaigns may be contributory.<sup>3</sup>

The MMM campaign provides a platform for opportunistic population-based screening especially for those who have never had their BP measured. Interestingly, over one-fifth of the MMM19 participants had never had their BP measured and about 95% were screened out of the hospital/clinic setting. The flexibility of the MMM which allows for screening in many different locations out of the hospital/clinic, including markets, churches, homes, workplaces, and other public areas, raises awareness on hypertension, screens, and provides counselling to persons who, otherwise, would not benefit if the activity were limited to the hospital/clinic or pharmacy.

Although the sample is neither randomly selected and therefore not nationally representative which may present potential biases, the potential beneficial impact of MMM19, and future campaigns cannot be overemphasized.

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