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

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During the May Measurement Month 2018 (MMM18) campaign, we aimed to raise hypertension awareness and measure blood pressure (BP) across different communities in Botswana. Study sites included four large villages and Gaborone (capital city). Screening sites were shopping malls, train stations, churches, and workplaces. Individuals aged ≥18 years were recruited through fliers, word of mouth, and as volunteer walk-ins at the sites. Demographic and risk factor data were collected through a questionnaire prior to measuring three BP readings per participant. Weight was measured while height was usually estimated. Hypertension was defined as: systolic BP ≥140 mmHg or diastolic BP ≥90 mmHg or taking antihypertensive medication. The mean of readings 2 and 3 was used and was estimated using multiple imputation where missing. Amongst 4599 participants whose BPs were measured, 54.5% were female, while mean age was 35.9 years. A total of 1510 (32.8%) participants were hypertensive and of those, 712 (47.1%) were aware of the hypertension. Only 35.2% of hypertensives were on antihypertensive treatment with 54.4% had controlled BP. Amongst all hypertensives, only 19.1% had controlled BP. Risk factors associated with higher BP included obesity, more than 1 unit of alcohol/week and BP measured on Sunday. Less than half (47.1%) of those identified as having hypertension during MMM18 were aware of their condition, despite the escalating prevalence of hypertension in the country. Regular BP awareness and opportunistic BP measurement campaigns like MMM are recommended to improve detection and control of hypertension and other cardiovascular risk factors.

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Introduction

The national prevalence of hypertension in Botswana was estimated at 16.9% in 2015.[1] According to the national STEPwise approach to Surveillance study (STEPS) 2007, Botswana recorded a five-fold increase in health service utilization due to hypertension between 1980 and 1998.[2] The number of hypertension-related admissions and deaths showed an overall upward trend between 2005 and 2009.[3] The number of new cases of hypertension was recorded at 41 604 in Botswana in 2010 with 7.9% of outpatient morbidity due to hypertension.[4]

Data published by the World Health Organization (WHO) in 2017 estimates that 301 (2.1%) of total deaths in Botswana were due to hypertension.[5] During the May Measurement Month campaign of 2017 (MMM17), hypertension appeared to be common among adults in Botswana, with low medication coverage, and associated with other cardiometabolic risk factors.[6] Among the 3587 participants screened in 2017, 1012 (27.8%) were hypertensive with only 21% ($n = 213$) of them on antihypertensive medication. Men were more likely to have hypertension (male 30.7% vs. female 25.7%, $P < 0.01$) and less likely to be on antihypertensive medication (male 7.8% vs. female 11.8%, $P < 0.01$). Hypertension was associated with multiple cardiometabolic risk factors including self-reported history of diabetes mellitus ($P < 0.01$), previous heart attack ($P < 0.01$), previous stroke ($P = 0.05$), being overweight ($P < 0.01$), smoking tobacco ($P = 0.01$), and alcohol consumption ($P = 0.05$).[6]

Given the high hypertension prevalence detected in the MMM17 campaign, we participated in MMM18 to further determine self-awareness of hypertension at the community level and to measure the prevalence and control of hypertension in other parts of Botswana by extending participation to new communities not previously surveyed in 2017. We hypothesized that the MMM18 campaign would yield different results from prior hypertension awareness campaigns on blood pressure (BP).

Methods

Ethics clearance was obtained from the Ministry of Health and University of Botswana. The study sites were four large villages (Molepolole, Mochudi, Ramotswa, Moshupa) and Gaborone. Screening sites included shopping malls, train stations, churches, and other workplaces. Each village team composed of two personnel: one research assistant (graduate nurse) and one lay person covering at least three[3] screening sites per assigned village. All teams covered Gaborone. All team members received 2 days of training on the study protocol and ethics at the University of Botswana, Faculty of Medicine. Daily supervision was provided for the first 2 weeks in Gaborone followed by weekly unannounced village supervisory visits. The campaign was preceded by raising public awareness through the MMM country Facebook page, radio shows, and opportunistic BP talks at places of employment. As part of the communication and engagement strategy, street art was also utilized as a dialogue between a local street artist, health professionals involved in the project, and other stakeholders. This interprofessional collaboration resulted in production of a mural carrying culturally relevant art installation on effects of hypertension for public exposure and to challenge public thinking. The mural currently stands at one of the large shopping centres in Gaborone.

Teams collected data daily at the designated sites from the 2nd week of May to the 2nd week of June 2018. Individuals aged ≥ 18 years were recruited through fliers, word of mouth, and as volunteer walk-ins at the sites. Participant demographics and risk factors were collected using the MMM18 questionnaire. All BP measurements were done in the sitting position, using OMRON automatic devices. Three BP readings were obtained per participant. Weight was measured while height was estimated. Hypertension was defined as: (i) systolic BP (SBP) ≥ 140 mmHg or diastolic BP (DBP) ≥ 90 mmHg derived from the mean of the 2nd and the 3rd BP readings[7] and (ii) individuals taking hypertension medication. Normal or controlled BP was defined as BP $<140/90$ mmHg. Data were entered directly into the MMM18 excel spreadsheet and shared for analysis, centrally by the MMM project team. The mean of readings 2 and 3 was used and was estimated based on the global data using multiple imputation where missing.[7]

Results

A total of 4599 participants had their BPs measured. Over half (2508) 54.5% were female. The mean age was 35.9 (± 13.9) years with the majority (64.6%) under 40 years. A total of 4589 (99.8%) were identified as being of black race and 4575 (99.5%) of the BP measurements were done outdoors. Nearly a 3rd (29.1%) did not have a BP recorded 12 months prior to the study.

There were 1510 (32.8%) participants with hypertension and out of those, 712 (47.1%) were aware of the hypertension with only 531 (35.2%) on antihypertensive treatment and 289 (54.4%) of those on antihypertensives having controlled BP. Among 4068 participants not on antihypertensive medication, 979 (24.1%) were hypertensive. Among all hypertensives only 19.1% had controlled BP.

In participants not taking antihypertensive medication, the association between age and sex with SBP showed a linear increase, with the mean BP in males prominently higher than the mean BP in females across ages below 85–90 years, when they became equal. The DBP association showed an inverted U curve, with the mean DBP in males exceeding the mean DBP in females at the age of 25 years, and the peak on the male curve at ages 45–50 years, while in females it was at ages 50–55 years (Supplementary material online, *Figure F1*).

A reduction in BP compared to baseline in both SBP 4.9 mmHg $P < 0.0001$ [confidence interval (CI) 3.4–6.5] and DBP 3.4 mmHg $P = 0.0001$ (CI 2.4–4.5) was associated with taking antihypertensive medication. A self-reported alcohol intake of ≥ 1 unit per week was associated with an increase in baseline DBP by 2.7 mmHg $P < 0.0001$ (compared to never/rarely take alcohol). Additionally, an increase in DBP of 4.9 mmHg from baseline was associated with obesity

$P < 0.0001$ (CI 3.9–5.8) compared to healthy weight (body mass index 18.5–24.9) (Supplementary material online, *Figure F2*).

Elevations in baseline SBP by 3.9 mmHg and DBP by 4.0 mmHg were observed in individuals where BPs were measured on a Sunday compared to when measured on a Monday, systolic $P = 0.002$ (CI 1.3–3.0) and $P < 0.0001$ (CI 2.2–5.8) for DBP (Supplementary material online, *Figure F3*).

Discussion

In our study, 32.8% of the participants were hypertensive, with 47.1% of these aware of being hypertensive. Of the 35.2% on treatment only 54.4% had controlled BP. Among individuals not on any medication for hypertension, 24.1% were found to have raised BP. Our MMM18 results show that the proportion of hypertension and uncontrolled hypertension among those with an established diagnosis remain high even in other locations in Botswana that were not surveyed during the MMM17 campaign.

The Botswana Non-Communicable Diseases (NCDs) strategy of 2017–22 aims to increase early diagnosis of hypertension by 25% and have 60% of hypertensives attain controlled BP by 2022.[4] Available national data used to inform new policies on tackling NCDs remains outdated as the NCD strategy relies on national health statistics figures from 2009 and the STEPS survey from 2014. For instance, we observed hypertension baseline prevalence of almost 33% in our study against a national baseline prevalence of 17%.[2] Consequently, a national strategy of increasing early diagnosis by 25% (from 17% to about 21%) will still fall short of identifying almost a 3rd of persons living with hypertension in Botswana. Therefore, findings from this study will contribute towards providing up to date information on awareness of hypertension and the need to revise the national target if most of those living with hypertension are to receive a formal diagnosis and relevant care. Current findings differ from those of MMM17 which had a slightly lower proportion of participants with hypertension (27.8%) and on treatment (21%). These differences could be explained by different survey locations; where MMM17 was only in Gaborone while MMM18 expanded to four villages in addition to Gaborone. The differences could also be explained by non-probabilistic sampling of participants. However, these differences may suggest that hypertension may be more prevalent outside the city of Gaborone.

Our study also revealed that BP control was achieved in approximately one-fifth of all people with hypertension which is much lower than the national target of 60% BP control.[4] A concerted national effort is needed to achieve this three-fold increase in BP control. Complications of uncontrolled BP include stroke and heart failure, 2 conditions recorded among the top 10 contributors to inpatient mortality in Botswana in 2010.[3] Several established traditional modifiable risk factors for elevated BP were also common in this setting. Therefore, innovative public health efforts targeting these risk factors are needed in order to prevent the onset of new hypertension cases.

Supplementary material

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

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