

May Measurement Month 2021: an analysis of blood pressure screening results from Kenya

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Hypertension is a major contributor to premature death and disability globally. The age-standardized prevalence of hypertension among adults aged 30-79 years is among the highest at 36%. Despite the availability of cost-effective interventions, awareness, treatment, and control rates remain low. To tackle this and raise awareness, the May Measurement Month (MMM) campaign was initiated by the International Society of Hypertension in 2017. This paper summarizes results from the 2021 MMM campaign. Screening was conducted in 22 sites across 7 counties. We aimed to take three blood pressure (BP) readings and corresponding heart rate measurements as per the standardized protocol. Where this was not achievable, at least one reading was taken. Other variables recorded included demographic data, risk factors, comorbidities, and history of COVID-19 infection. A total of 9738 individuals were screened, of whom 57% were female. After multiple imputations, 28.2% were hypertensive, of whom 45.9% were aware and 42.0% were on treatment. Of those on treatment, 50.3% were controlled, translating to control among only 21.1% of the total hypertensive population. Previous COVID-19 vaccinations were associated with lower systolic BP (SBP) and diastolic BP (DBP). Individuals who consumed alcohol one to three times a month had lower diastolic BP after adjustment for age, sex, and anti-hypertensive treatment. Among women, the use of hormonal contraceptives was associated with lower SBP and DBP after adjustment for age, sex, and anti-hypertensive treatment. Hypertension awareness, treatment, and control rates remain low, though trends from previous MMM campaigns in Kenya suggest steady improvement. The associations between COVID-19 vaccination and contraceptive use with lower BP warrant further investigation. Programmes such as MMM provide much needed data to track the progress towards reducing the burden of hypertension.

Introduction

Hypertension remains the leading risk factor for cardiovascular disease (CVD) mortality and disability globally.¹ Despite hypertension being preventable, the

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burden continues to rise—especially in Africa where the age-standardized prevalence among adults aged 30–79 years is among the highest at 36%.² Despite the availability of cost-effective behavioural and medical interventions, hypertension awareness, detection, treatment, and control rates remain alarmingly low.³ A national representative population-based survey conducted in Kenya in 2015 reported that 56% of respondents had never had their blood pressure (BP) measured. The prevalence of hypertension was reported at 24% out of whom 92% were not on medication at the time of the survey. Only 3% of Kenyans with hypertension were controlled with medication.⁴

The May Measurement Month (MMM) campaign, initiated by the International Society of Hypertension (ISH), is a global initiative aimed at increasing hypertension awareness. Kenya has participated in this annual campaign since its inception in 2017.^{5–7} Data from previous campaigns have demonstrated a trend towards improved awareness, treatment, and BP control.⁷ The positive correlation between CVD and severe COVID-19 infection were highlighted during the pandemic, emphasizing the importance of campaigns such as MMM.⁸ The 2021 MMM campaign was modified to take place between May and November in order to give countries the flexibility to schedule the screening activities amidst ongoing pandemic waves. Screening was conducted in strict observance of all COVID-19 disease prevention protocols. The findings from the 2021 campaign are reported here.

Methods

The Kenya Cardiac Society coordinated the screening activities with support from the MMM, including consenting adults aged 18 years and above between October 2021 and November 2021. Screening was conducted in 22 sites across 7 counties based on the availability of volunteers and qualified health professionals able to adequately supervise the exercise. The MMM provided training materials which were cascaded to the screening teams to standardize BP measurement. Ethical approval was obtained from the Kenyatta National Hospital Institutional Review Board. Screening was conducted at health facilities and public areas including marketplaces and urban centres. Calibrated Omron M3 digital BP measurement devices initially donated by OMRON Healthcare were provided by ISH and distributed to the participating sites.

We aimed to take three BP readings as per the standardized protocol, 1 min apart, and recorded with the corresponding heart rates. Where this was not achievable, at least one reading was taken. Other variables collected included demographic data, medical history, screening location, and self-reported

awareness of hypertension status. Participants' weight, medication use, history of alcohol intake, history of tobacco use, and comorbidities were also recorded. History of COVID-19 infection, COVID-19 vaccination, and hormonal replacement therapy were new variables collected in 2021. The data were collected using the MMM Excel spreadsheet or MMM mobile phone application. Hypertension was defined as a systolic BP (SBP) ≥ 140 mmHg and/or a diastolic BP (DBP) ≥ 90 mmHg (using the mean of the second and third BP readings) or being on treatment with at least one anti-hypertensive medication. Controlled BP was defined as an SBP of <140 mmHg and a DBP of <90 mmHg among those on anti-hypertensive medication.⁹ Those with untreated or uncontrolled BP received diet and lifestyle advice and were referred to health facilities for further care. Analysis was done centrally by the MMM project team with employment of multiple imputations for missing data on BP measurements.¹⁰

Results

A total of 9738 individuals were screened of whom 9631 (98.9%) were of black ethnicity, 5580 (57.3%) were female, and 49.6% were aged below 40 years. The majority was screened in a public area (65.2%) or at a health facility or pharmacy (34.0%). Only 609 (6.3%) reported that they had participated in previous MMM campaigns. Regarding COVID-19 infection, 255 (2.6%) reported having had a previous positive COVID-19 test and 5053 (51.9%) had 1 or more previous COVID-19 vaccination. A total of 331 (3.4%) participants had diabetes, 33 (0.3%) reported a history of previous myocardial infarction, and 27 (0.3%) had previously had a stroke. A total of 172 (1.8%) and 149 (1.5%) were taking aspirin or a statin, respectively. Regarding risk factors, 545 (5.6%) self-reported as being current smokers, 311 (3.2%) reported consuming alcohol daily, and 3804 (39.1%) met the World Health Organization recommended physical activity guidelines.

Of those screened, 2748 (28.2%) had hypertension out of whom 1262 (45.9%) were aware and 1153 (42.0%) were on anti-hypertensive medication, although anti-hypertensive medication use was only documented for 13.9% of participants. Females with hypertension were more likely to be aware (53.4%) compared with males (35.6%) and were also more likely to be on medication (48.4%) compared with males (33.0%). Of those on anti-hypertensive medication, 748 (64.9%) were on more than 1 medication class and 827 (71.7%) reported taking their medication regularly. Only 50.3% of participants on hypertensive medication had controlled BP with no significant difference between males and females. Overall, only 21.1% of all participants with hypertension

Table 1 Total participants and proportions with hypertension, awareness on medication, and with controlled blood pressure

Participants	No. (%) with hypertension	No. (%) of hypertensives aware	No. (%) of hypertensives on medication	No. (%) of those on medication with controlled BP	No. (%) of all hypertensives with controlled BP
All	2748 (28.2%)	1262 (45.9%)	1153 (42.0%)	580 (50.3%)	580 (21.1%)
Male	1148 (27.6%)	409 (35.6%)	379 (33.0%)	189 (49.8%)	189 (16.4%)
Female	1599 (28.7%)	853 (53.4%)	774 (48.4%)	392 (50.6%)	392 (24.5%)

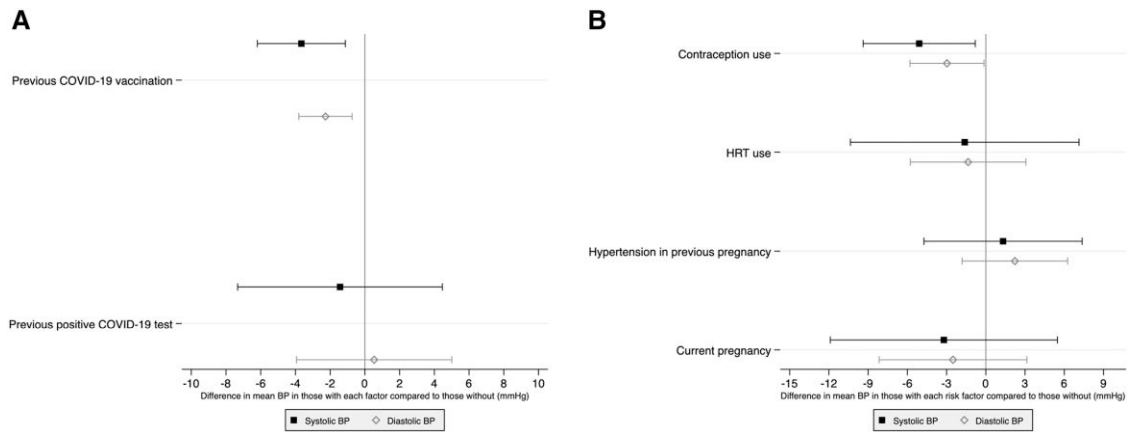


Figure 1 (A and B) Associations of blood pressure (BP) in the screened population. (A) Difference in mean BP in people with previous COVID-19 vaccination or previous positive COVID-19 test compared with participants without a previous history of the same. (B) Difference in mean BP in those with a history of contraception use, hormone replacement therapy (HRT) use, and hypertension in previous pregnancy or current pregnancy compared with those without from linear regression models, adjusted for age, sex, and anti-hypertension medication.

had controlled BP, higher among females (24.5%) compared with males (16.4%). This is summarized in [Table 1](#).

Having had a previous COVID-19 vaccination was associated with lower SBP (3.7 mmHg lower, $P=0.005$) and lower DBP (2.3 mmHg lower, $P=0.004$) after adjustment for age, sex, and anti-hypertensive treatment. The use of hormonal contraceptives was associated with lower SBP (5.1 mmHg lower, $P=0.02$) and DBP (3.0 mmHg lower, $P=0.04$) after adjustment for age, sex, and anti-hypertensive treatment. There was no association between BP with the hormone replacement therapy (HRT) use and hypertension in a previous pregnancy or current pregnancy ([Figure 1](#)).

Discussion

A total of 9738 individuals were screened, of whom the majority was female. Despite this being the fourth MMM campaign in the country, more than 90% had not participated in any of the previous MMM campaigns. Of those screened, 2748 (28.2%) had hypertension out of whom 45.9% were aware and 42.0% were on anti-hypertension medication. Only half of participants using BP-lowering medication had controlled BP, and only one in five of all hypertensives had controlled BP. The proportion of those screened with hypertension increased from 24.6% in 2017 to 28.2% in 2021. The last nationally representative survey conducted in 2015 reported an age-standardized prevalence of 24.5%,⁴ and although MMM is an opportunistic screening campaign, the figures align well and suggest a potential upward trend. The proportion of individuals with hypertension in MMM who were aware and those on medication has progressively increased over the years from 30.7% in 2018 to 45.9% in 2021 and from 26.6% in 2018 to 42% in 2021, respectively. The overall BP control rate among those with hypertension had also increased from 13% in 2018 to 21.1% in 2021. This points to a potential improvement in hypertension awareness and overall BP control rates from 15.6% and 3%, respectively, reported in the national survey.⁴ Individuals with previous COVID-19 vaccination revealed a lower SBP and DBP on average. The implications of these results are currently

uncertain, and further studies will be required to confirm these findings. In addition, contrary to the norm, contraceptive use was associated with lower SBP and DBP. The limitations of this study include the non-randomized recruitment of participants which could be associated with selection bias limiting generalizability of the findings. In addition, there was significant missing data for some variables notably on use of anti-hypertensive medication (86.1% missing). It is possible that the missing data reflect those not on medication; however, this can be clarified in future campaigns by reviewing the question to remove any ambiguity.

In conclusion, despite the steady improvement in hypertension awareness and BP control rates, more effort is required to accelerate the pace. In addition to improving hypertension awareness, the MMM campaign provides much needed data on hypertension trends which are critical to inform planning and resource allocation.

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Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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