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## May Measurement Month 2018: an analysis of blood pressure screening results in South Africa

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### KEYWORDS

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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 of the International Society of Hypertension (ISH) aimed at raising awareness of high BP and acting as a temporary solution to the lack of screening programmes worldwide. As part of MMM, screening in South Africa in 2017 revealed that 24.5% of adults (mean age = 31 years) have hypertension and only half of those with hypertension had controlled BP. These data highlight the need for continued screening and awareness campaigns. An opportunistic cross-sectional survey of volunteers aged  $\geq 18$  years was carried out in May 2018. Blood pressure measurements, the definition of hypertension and statistical analyses followed the MMM protocol. The sites screened were general populations and university campuses in preference to hospitals and clinics, aiming to raise awareness and allow access to screening to those less likely to be aware of their BP. In total, 2965 individuals (age  $40.5 \pm 18.2$  years) were screened. After multiple imputation for missing BP readings, 34.6% had hypertension, only 56.7% of those with hypertension were aware, 21.2% of those not receiving

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treatment for hypertension were hypertensive, and a large proportion (42.5%) of individuals receiving antihypertensive medication had uncontrolled BP. These results suggest that opportunistic screening campaigns can identify significant numbers with undiagnosed and uncontrolled hypertension. The high proportions of individuals with undiagnosed and treated uncontrolled hypertension highlight the need for hypertension awareness campaigns and more rigorous management of hypertension.

## Introduction

In South Africa, non-communicable diseases, of which hypertension is a major contributor, are now leading causes of death and disability.<sup>1</sup> In 2012, 43.4% of all deaths in South Africa were attributed to non-communicable diseases, compared with 33.6% due to HIV/AIDS and tuberculosis.<sup>2</sup> Moreover, deaths due to non-communicable diseases showed a steady increase from 1997 to 2012; whereas deaths due to HIV/AIDS and tuberculosis decreased.<sup>2</sup> The doubling of the prevalence of hypertension (from 24% in 1998 to 45% in 2016)<sup>3,4</sup> plays a major role in the burden of cardiovascular disease in South Africa. Despite the high prevalence of hypertension in South Africa, a large proportion of individuals remains untreated or has uncontrolled blood pressure (BP). Indeed, a previous South African community surveillance study conducted in 2016 revealed that only 6% of men and 9% of women were taking antihypertensive medication and had normal BP.<sup>4</sup> Although limited access to treatment for hypertension plays a role, other key factors include low awareness and lack of adequate hypertension screening facilities.<sup>5,6</sup> Hence, in 2017 South Africa joined May Measurement Month (MMM), a global initiative of the International Society of Hypertension (ISH) aimed at raising awareness of high BP and to act as a temporary solution to the lack of screening programmes worldwide. In 2017, 3250 adults were screened, 24.5% were found to have hypertension, 57.7% of those with hypertension were untreated, and 46.9% of individuals receiving antihypertensive medication had uncontrolled BP.<sup>7</sup> The 2017 results highlighted the need for repeated screening programmes in South Africa to increase awareness and education as well as to allow access to BP measurements for those who have never been screened before.

## Methods

### Study group

The study was approved by the Ethics Committees for each site (see [Supplementary material online](#)). Participants gave written informed consent. In total, 2965 participants aged 18 years and older were screened at various sites (see [Supplementary material online](#)).

### Blood pressure, demographic, and anthropometric measurements

Before the commencement of data collection, volunteers were trained in accurate BP measurement techniques using validated automated devices (Omron MIT5 Connect and

Omron M6 Comfort devices, donated by Omron Healthcare). Screening was primarily on weekdays for the duration of May. At least three seated BP and heart rate recordings were taken on the left arm (preferably) after at least 5 min rest with 1-min interval. A questionnaire was used to collect limited clinical and demographic data as previously described.<sup>8</sup> The data were either entered directly onto a bespoke mobile application or entered onto a study-specific worksheet (Excel). The data were cleaned by each of the site principal investigators (PIs) before submitting to MMM centrally.

### Data analysis

Hypertension was defined as BP  $\geq$  140/90 mmHg or those on antihypertensive treatment, and BP control as BP < 140/90 mmHg. The data were analysed centrally by the MMM project team.<sup>8</sup> Crude analyses were done using the mean of the 2nd and 3rd BP readings where available. For comparisons of BP between all individuals, multiple imputation was used to estimate the average of the 2nd and 3rd readings where either reading was not documented ( $n = 115$ ). Linear regression models were run separately for systolic and diastolic BP to look for the strength of associations with BP.

## Results

The characteristics of those individuals screened are shown in [Supplementary material online, Table S1](#). The participants were aged  $40.5 \pm 18.2$  years on average, included more women than men, and were predominantly of black or white ethnicity. 54.4% of the study population was overweight or obese. The proportions of participants with diabetes or prior cardiovascular events were low.

In total, 1025 (34.6%) participants were found to have hypertension. Only 581 (56.7%) of those with hypertension were aware that they had hypertension. 521 (21.2%) of those not receiving antihypertensive medication had hypertension. Only 49.2% of hypertensives were receiving antihypertensive medication, and only 57.5% of individuals receiving antihypertensive medication had controlled BP. The proportion of all hypertensives with controlled BP was only 28.3%.

Based on a linear regression model, in those who were not receiving antihypertensive medication, both systolic and diastolic BP showed an increase with age. In women, BP was lower than in men ([Supplementary material online, Figure S1](#)). The increase in systolic BP with advancing age up to the age of  $\sim 60$  years was steeper in women. However, the increase in diastolic BP with advancing age

paralleled that of men. Systolic and diastolic BP were higher in obese ( $7.2 \pm 0.8$  and  $5.3 \pm 0.5$  mmHg, respectively,  $P < 0.0001$ ) or overweight subjects ( $4.4 \pm 0.7$  and  $2.9 \pm 0.5$  mmHg, respectively,  $P < 0.0001$ ) than in normal weight. Systolic and diastolic BP were higher ( $6.6$  and  $4.1$  mmHg, respectively,  $P < 0.0001$ ) in treated than untreated subjects (Supplementary material online, Figure S2). Systolic but not diastolic BP was marginally higher in those reporting regular alcohol intake ( $1.5$  mmHg,  $P < 0.05$ ); whereas neither systolic nor diastolic BP differed between smokers and non-smokers (Supplementary material online, Figure S2). Diastolic BP but not systolic BP was significantly lower in pregnant women ( $5.6$  mmHg,  $P < 0.01$ ) (Supplementary material online, Figure S2).

## Discussion

The MMM18 programme in South Africa detected that more than a third of screenees had hypertension, and only 56.7% of hypertensives were aware that they had hypertension. Only one in two hypertensives received treatment for hypertension, and the vast majority (71.7%) had uncontrolled BP. Although a similar number of participants were screened as compared with 2017, importantly only 8.7% of the participants had participated in MMM17. The majority (87.7%) of those screened in 2018 reported having had their BP measured previously. Moreover, 67.8% had their BP measured within the past 12 months. Hence, although two-third of individuals are having their BP checked annually, plans to improve awareness and BP control in hypertensives are urgently required.

Although, one-third of participants had hypertension, this proportion is marginally lower than the prevalence of hypertension (women: 43%; men: 51%) previously reported for those aged 35–44 years in 2016,<sup>4</sup> and in a cohort with a similar mean age (43 years) from a community-based study (40.4%).<sup>9</sup> That only half of hypertensives were receiving treatment for hypertension also confirms previous reports from a community-based study (52.7%),<sup>10</sup> in rural and urban research sites (21.6–55.8%),<sup>11</sup> and in a cohort study of hypertensive nurse practitioners (59%).<sup>12</sup> Similarly, the low proportion with controlled BP is in keeping with low proportions with controlled BP on medication (women: 6.7%; men: 2.5%) previously reported for those aged 35–44 years in South Africa in 2016,<sup>4</sup> and in data from a community-based study,<sup>10</sup> a cohort study<sup>12</sup> and in rural and urban research sites<sup>11</sup> where 77.4%, 61.9%, and 67.7–92.2% of hypertensives had uncontrolled BP, respectively. The proportions of South Africans with hypertension, aware that they have hypertension, receiving antihypertensive treatment and having uncontrolled BP are comparable with the worldwide data reported for screening in 2018.<sup>13</sup> The relatively high proportions with hypertension and uncontrolled BP, and low proportion receiving medication, highlight the urgent need for improved healthcare systems for better detection and management of hypertension in South Africa.

In keeping with worldwide data, increased BP was associated with advancing age, and systolic BP showed a greater

increase with age in women compared with men.<sup>8,13</sup> Although BP was higher in those with increased body weight, similar to data worldwide (only 7 and 4 mmHg higher systolic and diastolic BP, respectively in obese compared to underweight),<sup>8,13</sup> and data from screening in South Africa in 2017,<sup>7</sup> the clinical impact at an individual level appears relatively small.

The marginal associations between BP and regular alcohol intake and tobacco use, possibly reflect the relatively low percentages of individuals reporting regular alcohol intake and tobacco use. Indeed, the proportion of individuals reporting regular alcohol intake (19.8%) was lower than that reported in the 2017 screening campaign (36.2%), and the percentage reporting tobacco use (12.4%) was slightly lower than previously reported (14.2%).<sup>7</sup> It is possible that the introduction of taxes and policies by the South African government to reduce the use of tobacco and alcohol, may have had some effect. As reported in 2017,<sup>7</sup> the lack of strong relationships between previous myocardial infarction, previous stroke or diabetes and BP is most likely due to the low proportions of individuals with these conditions.

The limitations of the present study include the voluntary nature of the programme, and therefore, the participation of only a limited number of regions of South Africa. Hence, the data are unlikely to be representative of all provinces in South Africa. Indeed, the sample is an opportunistic sample and not a random sample. The low numbers of individuals with previous cardiovascular events or diabetes precluded meaningful analyses on the relationships with BP, and there is a possibility of false-positive diagnosis of hypertension, due to screening on only one occasion.

In conclusion, the results of the present study again highlight the need for repeated screening programmes to increase awareness and education; but moreover, emphasize the urgency to introduce plans to improve BP control in hypertensive individuals.

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**Conflict of interest:** none declared.

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