



ESC

European Society
of Cardiology

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

Hae-Young Lee¹, Gyu Chul Oh¹, Il Suk Sohn², Sungha Park³, Jinho Shin⁴, Thomas Beaney^{5,6}, Giles Partington⁵, Neil R. Poulter⁵, and Myeong-Chan Cho  ^{7*}

¹Department of Internal Medicine, Seoul National University College of Medicine, Seoul, Korea

²Department of Internal Medicine, Kyung Hee University School of Medicine Department, Seoul, Korea

³Department of Internal Medicine, Yonsei University, Seoul, Korea

⁴Department of Internal Medicine, Hanyang University College of Medicine, Seoul, Korea

⁵Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London W12 7RH, UK

⁶Department of Primary Care and Public Health, Imperial College London, St Dunstan's Road, London W6 8RP, UK; and

⁷Department of Internal Medicine, College of Medicine, Chungbuk National University, 1, Chungdae-ro, Seowon-gu, Cheongju 28644, Korea

KEYWORDS

Hypertension;
Blood pressure;
Screening;
Awareness;
Treatment;
Control

Hypertension is the biggest contributing risk factor to cerebrovascular disease and is associated with increased risk of coronary artery disease. The May Measurement Month (MMM) campaign is a global initiative aimed at raising awareness of hypertension and acting as a temporary solution to the lack of screening programs worldwide. An opportunistic cross-sectional survey of participants aged ≥ 18 was carried out during May 2019 in Korea. Over 10 000 participants were recruited in the MMM campaign in Korea, with a slogan of 'A simple measure to save lives—#checkyourpressure'. A total of 9975 participants with valid clinical and blood pressure (BP) data were used for analysis. All participants were Korean in ethnicity, mean age was 57.2 (SD \pm 21.2) years, 57.7% were females, and the mean body mass index was 23.4 kg/m² (SD \pm 3.3). In total, 37.7% of the participants reported a previous diagnosis of hypertension, and 91.3% of those diagnosed were on antihypertensive medications. For other comorbidities, 11.6% reported having diabetes mellitus, 2.0% had previous stroke, and 1.0% had previous myocardial infarction. Mean BP was 130.0/81.0 mmHg in the overall population. After multiple imputation, 47.6% of participants were classified as hypertensive (systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg or on treatment for raised BP). Among all hypertensive participants, the awareness rate, the treatment rate, and the control rate (systolic BP < 140 mmHg and diastolic BP < 90 mmHg) were 76.2%, 74.0%, and 50.5%, respectively. Of those on antihypertensive medication, the control rate was 68.2%. While awareness and treatment rates were relatively high in the MMM19 campaign, the BP control rate of the total hypertensive population was still only $\sim 50\%$, which demands more emphasis on strict BP control.

Introduction

Hypertension is a widely prevalent condition that affects over 1 billion people worldwide. Although, significant

*Corresponding author. Tel: +82 43 269 6356, Fax: +82 43 269 6354, Email: mccho@chungbuk.ac.kr

evidence has emerged on the benefits of early intervention and proper management, most hypertensive patients are asymptomatic, so the awareness rate is often below 50%.¹ There is an urgent need for relevant action to increase awareness of hypertension by ‘knowing one’s blood pressure’.

May Measurement Month (MMM) is an initiative of the International Society of Hypertension (ISH), with a primary goal of improving hypertension awareness by measuring blood pressure (BP) in millions of people worldwide.² From 2019, the Korean Society of Hypertension (KSH) actively responded to the call of ISH and led the project in Korea. The slogan of MMM19 is ‘A simple measure to save lives—#checkyourpressure’. In this article, the authors report the findings from the first MMM campaign held in Korea.

Methods

Study design and participants

The MMM19 campaign in Korea (K-MMM19) was led by the KSH in collaboration within the Korea Disease Control and Prevention Agency (KDCA), the Seoul Metropolitan Government, and the Korea Non-communicable disease (NCD) Network for the selection of BP measurement sites, recruitment and training of volunteers, and the organization and execution of the campaign. The K-MMM19 sites were established at community health centres, regional Cardiocerebrovascular centres, Seoul city hall, and a few selected multiuse facilities. Through flyers, posters, press conferences, and online news releases, adults aged ≥ 18 years were recruited to participate in the MMM19 campaign after obtaining written informed consent. The Ethics Committee of Chungbuk National University Hospital (Cheongju, South Korea) approved the study.

During May of 2019, the MMM campaign was held at 25 community health centres under the Seoul Metropolitan Government, 19 regional hypertension and diabetes mellitus management centres under the KDCA, and seven regional Cardiocerebrovascular centres. Additionally, the Seoul Metropolitan Government conducted a 7-day BP measurement event in the first and last week of May, and a street campaign was held at Seoul City Hall Plaza.

Measurements of blood pressure and administration of the questionnaire

Trained volunteer investigators from 25 community health centres and the KSH measured BP at least once after the participant had rested for at least 5 min in sitting position. At most measurement sites, a validated automated BP monitor, Omron HEM-9200T (Omron Healthcare, Kyoto, Japan), was used. Hypertension was defined as a BP of ≥ 140 mmHg in systolic or ≥ 90 mmHg in diastolic or the use of antihypertensive medication. Trained investigators also measured height, body weight, and waist-and-hip circumferences. A standardized short questionnaire was performed to acquire information on demographics, medical history, lifestyle, and use of medications. Throughout the campaign, we promoted healthy lifestyle changes, including a low salt diet, increasing physical activities, and smoking cessation.

Statistical analysis

Data cleaning was performed according to the standard protocol used in previous global MMM campaigns. The data were analysed centrally by the MMM project team and multiple imputation performed to impute the mean of readings two and three where this was missing.²

Results

Data were included on 9975 participants who took part in MMM. All participants were Korean in ethnicity, the mean age was 57.2 (SD \pm 21.2) years, and 57.7% were females. The mean body mass index was 23.4 kg/m² (SD \pm 3.3). The proportion of current smokers was 4.2% and 8.9% of the population reported consuming alcohol ≥ 1 /week. For other comorbidities, diabetes (11.6%), a previous stroke (2.0%), and a previous myocardial infarct (1.0%) were reported, and 6.6% and 9.2% of participants were taking aspirin and statins, respectively.

Only 229 (2.3%) participants had three BP readings recorded. After multiple imputation, to impute the mean of the second and third BP reading, 47.6% of participants were classified as having hypertension and the awareness rate was 76.2%. The overall treatment rate was 74.0% and the control rate among treated hypertensives was 68.2%. Control rate of the overall hypertensive population was 50.5%. The crude proportion of patients with high BP increased with age. Systolic BP continuously increased with age, whereas diastolic BP showed an inverted U shape, with the highest levels at 50–59 years. Both systolic and diastolic BP were higher in men than in women under the age of 80, but from ages over 50, BP values escalated swiftly in women, such that in octogenarians and older, BP was higher in women than in men (*Figure 1*).

Discussion

Among almost 10000 participants recruited in the K-MMM19 campaign, nearly half were hypertensive. Although the awareness and treatment rates were both reasonable at about 75%, the BP control rate of the overall

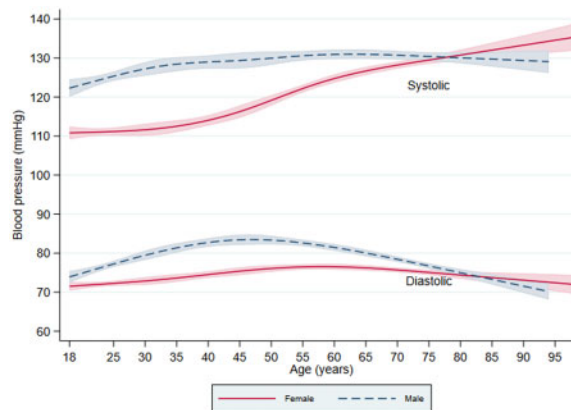


Figure 1 Change in blood pressure with age and sex from linear regression model, excluding individuals receiving treatment.

hypertensive population was still only 50%, which demands further focus on strict BP control.

According to the Korea National Health and Nutrition Examination Survey (KNHANES), a nationally representative population-based survey between 1998 and 2018, the prevalence of hypertension in Korean adults has been stable at 30%.³ However, the unadjusted prevalence of hypertension has continuously increased, owing to population aging. The rates of awareness, treatment, and control of hypertension have shown substantial and steep improvements. However, these rates reached a plateau, and no significant improvements have been observed since 2013. In detail, the awareness of hypertension increased from 25% in 1998 to 65% in 2007 but remained at 65% until 2018.⁴

Although the K-MMM19 campaign was highly successful, there are still areas for improvement. First, only about 2% had all three readings taken and BP levels were intended to be based on the average of reading two and three. However, use of multiple imputation was able to correct for this, based on global data from MMM to minimize the likelihood of overestimation of BP levels. Additionally, the MMM campaign was an opportunistic event, thus random sampling was not applied to recruitment. As a result, the mean average age of the study population was 57 years, and only a small number of participants under 40 years were recruited. We hope to modify and re-educate volunteers for a more successful K-MMM in future.

In conclusion, the MMM19 campaign in Korea reported that half of the participants had hypertension, which is higher than found in previous national data. While awareness and treatment rate were relatively high, the BP control rate of all the hypertensive participants included was still only around 50%. Hence, focus on better BP control is

needed for the improved prevention of cardiovascular complication or mortality.

Acknowledgements

We sincerely thank to the KDCA, Seoul Metropolitan Government, Korea NCD network, OMRON Korea, Servier Korea, and volunteers for the MMM19 campaign.

Funding

This study was supported by the Korean Society of Hypertension.

Conflict of interest: none declared.

References

1. Kim HC, Ihm SH, Kim GH, Kim JH, Kim KI, Lee HY, Lee JH, Park JM, Park S, Pyun WB, Shin J, Chae SC. 2018 Korean Society of Hypertension guidelines for the management of hypertension: part I-epidemiology of hypertension. *Clin Hypertens* 2019;25:16.
2. Beane T, Schutte AE, Stergiou GS, Borghi C, Burger D, Charchar F, Cro S, Diaz A, Damasceno A, Espeche W, Jose AP, Khan N, Kokubo Y, Maheshwari A, Marin MJ, More A, Neupane D, Nilsson P, Patil M, Prabhakaran D, Ramirez A, Rodriguez P, Schlaich M, Steckelings UM, Tomaszewski M, Unger T, Wainford R, Wang J, Williams B, Poulter NR; May Measurement Month Investigators. May Measurement Month 2019: the global blood pressure screening campaign of the international society of hypertension. *Hypertension* 2020;76:333-341.
3. Kang SH, Kim SH, Cho JH, Yoon CH, Hwang SS, Lee HY, Youn TJ, Chae IH, Kim CH. Prevalence, awareness, treatment, and control of hypertension in Korea. *Sci Rep* 2019;9:10970.
4. Korean Society H, Kim HC, Cho MC, Hypertension Epidemiology Research Working Group. Korea hypertension fact sheet 2018. *Clin Hypertens* 2018;24:13.