

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

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Elevated blood pressure (BP) is a significant burden worldwide, leading to high cardio-cerebro-reno-vascular morbidity and mortality. For the second year of the May Measurement Month (MMM) campaign in Indonesia in 2018, we recruited 174 sites in 31 out of 34 provinces in Indonesia and screened through convenience sampling in public areas and rural primary health centres. Hypertension was defined as systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg, or both, or on the basis of receiving antihypertensive medication. Blood pressure was measured three times followed the standard global MMM protocol, multiple imputation was used to estimate the mean of the 2nd and 3rd BP readings if these were not recorded. A total of 91 222 individuals were screened, and after multiple imputations, 27 331 (30.0%) had hypertension. Of individuals not receiving antihypertensive medication, 14 367 (18.4%) were hypertensive. Among the 47.4% of hypertensive individuals on antihypertensive medication, 10 106 (78.0%) had uncontrolled BP. MMM17 and MMM18 were still the most extensive standardized screening campaigns for BP measurement in Indonesia. Compared to the previous study, the proportion with uncontrolled BP on medication was significantly higher and provided the substantial challenges in managing hypertension in the rural community.

Introduction

Hypertension remains a major cause of death in high-income and low-income countries.¹ It is estimated that almost two-thirds of deaths in these countries are caused by hypertension-related diseases.² Meanwhile, in the Southeast Asia region, 35% of adults are estimated to have hypertension, with $\sim 9.4\%$ of deaths attributed to hypertension.³ The high level of cardiovascular mortality is associated with a low awareness and high proportion of uncontrolled blood pressure (BP).⁴⁻⁶ In Indonesia, the lowest awareness level was reported among males and those living in rural areas.⁷ An effort to increase awareness and BP monitoring can reduce mortality and morbidity.^{8,9}

The Indonesian basic health surveys in 2013 and 2018 showed that 25.8-34.1% of adults had raised BP.⁷ In concordance, as part of initiative of the International Society of Hypertension, the May Measurement Month (MMM) screening campaign in Indonesia in 2017 showed 34.5% adults have hypertension.¹⁰ We further observed the issues of low awareness level and high proportion of uncontrolled BP among those on antihypertensive medications.¹⁰ Learning from MMM17 experiences, with the support from MMM global team, in 2018, we were excitedly continuing the screening programme, with the majority of the successful screening sites being in primary health care facilities in rural communities.

Methods

The Indonesian MMM18 survey is part of the global MMM initiative. It was conducted and funded by the Indonesian Society of Hypertension (InaSH), which includes the Indonesian Heart Association (PERKI), Indonesian Neurological Association (PERDOSSI), and Indonesian Nephrology Association (PERNEFRI); with close collaboration with the Ministry of Health. The ethical clearance was obtained from Universitas Padjajaran, Bandung. We recruited 174 sites in 31 out of 34 provinces of Indonesia,

with 318 volunteers registered in our database. For volunteers, information of protocols and directions were given by e-mail communication.

This is a cross-sectional survey with a convenience sampling technique, and this year, we had screened mostly in the primary health centres in communities, and the university. We distributed leaflets on BP awareness during the campaign and emphasized the importance of measuring three BP readings at the sites. Hypertension was defined as systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg, or both, or on the basis of receiving antihypertensive medication. Blood pressure was measured three times followed the standard global MMM protocol and multiple imputation was used to estimate the mean of the 2nd and 3rd BP readings if these were not recorded.¹¹ Height and weight were estimated. Due to unavailability of automated BP devices in primary health centres at rural communities, only $\sim 35\%$ of measurements were obtained using digital BP devices, while others were measured by manual BP devices. Data collection was done by sending hard copies to the InaSH secretariat or by spreadsheets. Data were cleaned locally by our team and further analysed centrally by MMM analysts.

Results

During May 2018, 91 222 individuals were screened, of whom 68 846 individuals completed three BP readings, with a mean age of 45.0 ± 16.3 years and 18.6% of participants were in the age group of 18-29 years old. More women (59%) than men (41%) were screened. About 14.2% of participants were taking antihypertensive medications, 3651 (4.0%) participants reported having diabetes, 1536 (1.7%) reported a history of myocardial infarction (MI), 897 (1.0%) had a history of stroke, and 9365 (10.3%) were active smokers. The mean body mass index was $23.7 \pm \text{kg/m}^2$ ([Supplementary material online, Table S1](#)).

Among 68 846 participants with three BP readings, the mean of the 2nd and 3rd readings was lower than the first reading ([Supplementary material online, Table S2](#)). After

imputation, 27 331 (30.0%) were hypertensive. Of those who were hypertensive, 13 018 (47.6%) individuals were aware of having hypertension and 12 964 (47.4%) were being treated with antihypertensive medication, of whom 10 106 (78.0%) still had uncontrolled BP.

We observed that individuals receiving antihypertensive medications had significantly higher systolic and diastolic BPs than those who were not. In contrast, after adjusting for age, sex, and antihypertensive treatment, systolic and diastolic BPs were significantly lower in those with diabetes and those with a previous history of MI. Only systolic BP was lower in smokers ([Supplementary material online, Figure S1](#)). Overweight and obese participants (vs. healthy weight) were associated with higher systolic and diastolic BPs. Conversely, underweight vs. healthy weight participants were associated with lower systolic and diastolic BPs ([Supplementary material online, Figure S2](#)). Our study also found that diastolic BP was lower on Fridays and Saturdays (weekends) compared to measurements taken on Mondays.

Discussion

In this survey, the proportion of participants with hypertension was 30.8%, lower than the worldwide data of 33.4% and from the region of South-East Asia and Australasia with 35.4%.¹¹ The mean BP from the 2nd and 3rd readings was 123.3/78.3 mmHg, comparable to worldwide data of 122.5/77.7 mmHg. The median age of our participants was 45, with a higher proportion in the group of 18–29 years old than in older age groups, which may in part explain the lower proportion of high BP compared to our MMM17 data with 34.5%.¹⁰

The major difference in Indonesian MMM18 was the participation of the screening sites. About 70% of screening sites were in primary health care settings, with successful application of three BP readings in most of those sites, in line with our advocacy to the government following last year's recommendation. While we could reach only 31 of 34 provinces in the country this year, the distribution of screening sites was wider and reached more rural areas as compared to 2017. This may reflect in some of the findings this year, as we observed proportion of individuals on anti-hypertensive medication who have not achieved target BP (78%) is significantly higher as compared to global data of 40.0%, and indeed reflects the significant burden of managing hypertension in our community. However, in concordance with our MMM17 results, we observed that individuals with diabetes or a previous history of MI had significantly lower BPs than those without these conditions.¹⁰ Again, this finding suggested a possible better awareness of BP control in individuals who had suffered from hypertension-medicated organ damage.

We observed the mean systolic BP in women is higher than in men over 65 years of age ([Supplementary material online, Figure S3](#)) but is a lower at a young age (excluding subjects on medication), while diastolic BP shows similar pattern both in men and women. This is in contrast to the global studies which show that an increase in systolic BP occurs at the age of over 75 years, where diastolic BP shows an inverted U shape in line with the increased age.¹¹

Despite the study limitations that has been described in the global MMM18 publication, the Indonesian MMM18 campaign was useful and provided reliable evidence to support further advocacy for public health policymaking.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal Supplements* online.

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