


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

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## KEYWORDS

Hypertension;  
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Control

To further improve awareness, treatment, and control of hypertension, the May Measurement Month (MMM) campaign continued in 2018 in China. Study subjects were adults aged 18 years or more, ideally those who had not their blood pressure (BP) measured for at least a year. Blood pressure was measured three times consecutively with a 1-min interval in the sitting position, using automated BP monitors in 288 342 participants and transmitted to a central database by a smartphone app. Questionnaire data were collected with the same app. After imputation, the overall proportion of hypertension was 29.8%. Of those with hypertension, the rates of awareness, treatment, and control were 62.3%, 57.3%, and 35.9%, respectively. In analysis based on linear regression models, both systolic and diastolic BP were higher with cigarette smoking, alcohol intake, and overweight and obesity. Our study results suggest that hypertension management is improving in comparison with the data in MMM 2017 and the nationwide survey in 2012-15, and several known lifestyle factors are key to hypertension management.

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## Introduction

In 2017, we conducted the May Measurement Month (MMM) project in China.<sup>1</sup> We measured blood pressure (BP) in a large number of people living in several provinces of China. In the 364 000 Chinese participants enrolled in the MMM 2017, the proportion of hypertension was 24.7%, and the rates of awareness, treatment, and control of hypertension were 60.1%, 42.5%, and 25.4%, respectively. The Chinese had a similar proportion of hypertension as the international collaboration of 1 201 570 participants,<sup>2</sup> but somewhat lower awareness, treatment, and control rates of hypertension. However, these rates from an opportunistic screening for hypertension were similar to the data from the recent China nationwide BP survey.<sup>3</sup> We felt that such an initiative was indeed encouraging and therefore repeated the MMM project in China in 2018.

## Methods

The Chinese project strictly followed the MMM 2018 world-wide protocol and was conducted from May to September 2018.<sup>4</sup> A team of experts from various parts of the Chinese mainland helped for the selection of measurement sites ( $n = 367$ ), recruitment and training of volunteer investigators (~2000), and organization of measurement work during the whole period of the project. The measurement sites included hospitals/clinics, public areas (indoor or outdoor), workplaces, pharmacies, and so on. The Ethics Committee of Ruijin Hospital, Shanghai Jiaotong University School of Medicine, Shanghai, China approved the study

protocol. All study participants gave an informed written consent.

Study subjects were adults aged 18 years or more, ideally those who had not measured their BP for at least 1 year. Blood pressure was measured three times consecutively with a 1-min interval in the sitting position using validated automatic BP monitors (Omron HEM 9200, Omron Healthcare, Kyoto, Japan) and transmitted to a central database via a smartphone app. Questionnaire data including demographics, medical history, lifestyle, and use of medications were collected with the same app. Waist and hip circumferences were measured.

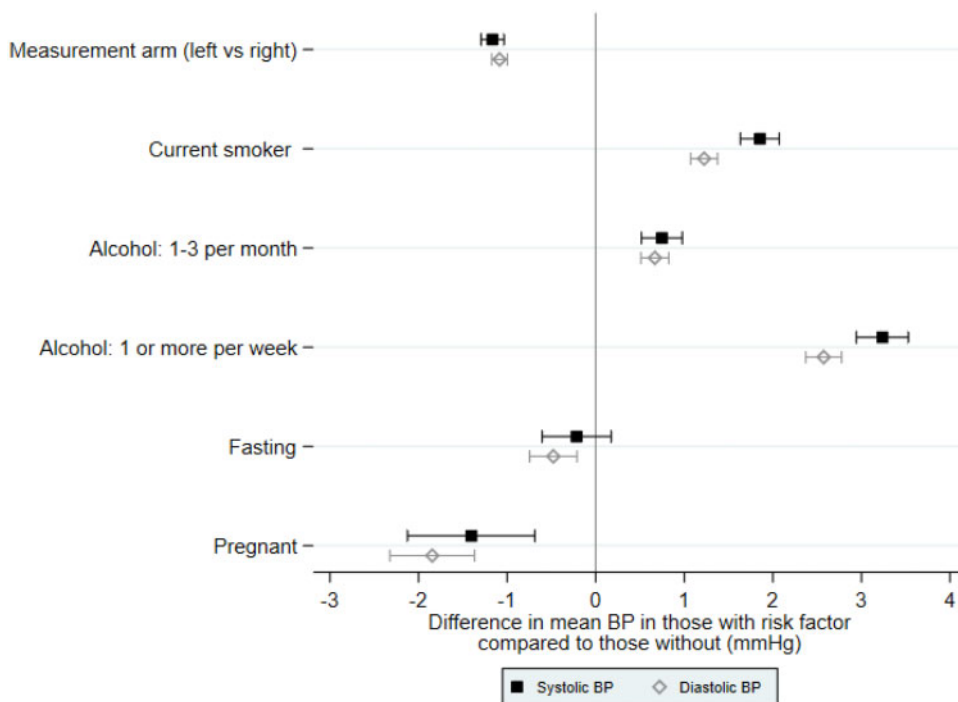
Hypertension was defined as a BP of at least 140 mmHg systolic or at least 90 mmHg diastolic, or as the use of anti-hypertensive drugs. Control of hypertension was defined as a BP below 140/90 mmHg.

Data analysis was performed by the MMM project international team, with multiple imputations for the mean of readings 2 and 3 where these were missing.<sup>4</sup>

## Results

The 288 342 study participants had a mean (standard deviation) age of 48.2 (16.4) years and included 53.3% ( $n = 153 811$ ) women and 17.1% ( $n = 49 167$ ) who took anti-hypertensive medication.

After imputation, the proportion of participants with hypertension was 29.8% ( $n = 85 835$ ). The awareness, treatment, and control rates of hypertension were 62.3% ( $n = 53 453$ ), 57.3% ( $n = 49 167$ ), and 35.9% ( $n = 39 784$ ), respectively. In those patients on antihypertensive medication, the control rate of hypertension was 62.6%. Of those



**Figure 1** Difference in mean systolic and diastolic blood pressure in those with each risk factor compared to those without, based on linear regression models, adjusted by age, sex (with an interaction), and antihypertensive medication (pregnancy adjusted by age and antihypertensive medication alone). Error bars represent 95% confidence intervals.

not on antihypertensive medication, the proportion with hypertension was 15.3% ( $n = 36\,668$ ).

After adjustment for age, gender (with an interaction term), and use of antihypertensive medication, both systolic and diastolic BP were significantly ( $P \leq 0.001$ ) higher with cigarette smoking ( $n = 28\,227$ ), alcohol intake ( $n = 38\,099$ , *Figure 1*), and overweight and obesity ( $n = 82\,049$ ). Indeed, systolic/diastolic BP was 1.9/1.2 mmHg higher in smokers than non-smokers, 3.2/2.6 mmHg higher in alcohol drinkers (one or more per week) than non-drinkers (*Figure 1*), and 3.0/1.8 mmHg lower in underweight subjects and 4.0/2.6 and 5.9/3.6 mmHg higher in overweight and obese subjects, respectively, compared with healthy weight subjects.

## Discussion

Our study showed that the proportion of hypertension in Chinese adults in MMM 2018 was 29.8%, and the rates of awareness, treatment, and control of hypertension were 62.3%, 57.3%, and 35.9%, respectively. In treated patients, the control rate of hypertension was 62.6%. Compared with the data in MMM 2017,<sup>1</sup> the proportion of hypertension was higher by an absolute percentage of 5.1% from 24.7%, treatment by 14.8% from 42.5%, the control rate by 10.5% from 25.4%, and the treated and controlled rate by 2.8% from 59.8%, respectively. However, our study was based on opportunistic screening and not random sampling. Hence selection differences may explain these findings.

Our data in MMM 2018 further showed that lifestyle factors played an important role in BP elevation in the Chinese population. The prevalence of cigarette smoking and alcohol intake in Chinese men were high. The prevalence of overweight and obesity was also high. These results suggest that lifestyle modification measures have to be seriously considered in the management of hypertension in China as in many other countries.

In conclusion, the results of the China MMM 2018 suggest that hypertension management is still quite challenging in line with the data in MMM 2017<sup>1</sup> and the nationwide survey in 2012-15,<sup>3</sup> and several known lifestyle factors are key to hypertension management.

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**Conflict of interest:** J.-G.W. reports having received lecture and consulting fees from Astra-Zeneca, Bayer, Omron, Servier, and Takeda. The others declare no conflict of interest.

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