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

**János Nemcsik[1,2,3], Dénes Páll[1,4], Zsuzsanna Nemes-Nagy[5], Mária Bacskai[6], Tibor Kovács[7], Béla Benczúr[8], Attila Kiss[9], György Ábrahám[10], István Barna[11], Thomas Beaney[12,13], Jonathan Clarke[14], Neil R. Poulter[12], and Zoltán Járai[1,15,16]***

[1]*Hungarian Society of Hypertension, Tetenyi str. 12-16, Budapest 1115, Hungary*
[2]*Department of Family Medicine, Semmelweis University, Budapest, Hungary*
[3]*Health Service of Zugló (ZESZ), Budapest, Hungary*
[4]*Department of Medicine and Coordination Centre for Drug Development, University of Debrecen, Debrecen, Hungary*
[5]*Hungarian National Blood Transfusion Service, Budapest, Hungary*
[6]*General Practitioner Office, Hajdúböszörmény, Hungary*
[7]*2nd Dept. of Internal Medicine and Nephrological Center, University of Pécs Medical School, Hungary, Pécs*
[8]*Balassa János Hospital, Tolna County, Szekszárd, Hungary*
[9]*Bács-Kiskun County Hospital, Kecskemét, Hungary*
[10]*Nephrology-Hypertension Center, 1st Dept. of Medicine, University of Szeged, Szeged, Hungary*
[11]*Department of Internal Medicine and Oncology, Semmelweis University, Budapest, Hungary*
[12]*Imperial Clinical Trials Unit, Imperial College London, UK*
[13]*Department of Primary Care and Public Health, Imperial College London, UK*
[14]*Department of Mathematics, Huxley Building, South Kensington Campus, Imperial College London, UK*
[15]*Department of Cardiology, St. Imre University Teaching Hospital, Budapest, Hungary; and*
[16]*Department of Vascular Surgery, Semmelweis University, Section of Angiology, Budapest, Hungary*

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Cardiovascular diseases are not only the leading causes of mortality in Hungary but also the mortality rate is twice as high as the European Union average, so screening programmes identifying subjects with elevated blood pressure (BP) are of utmost importance. May Measurement Month (MMM) is an annual global initiative that began in 2017 aimed at raising awareness of high BP. Hungary joined the 3rd campaign of MMM in 2019 and an overview of the results are presented in this paper. An opportunistic cross-sectional survey of participants aged $\geq$18 years was carried out in May 2019. Hypertension was defined as systolic BP $\geq$140 mmHg and diastolic BP $\geq$90 mmHg or treatment for hypertension, statistical analysis followed the standard MMM protocol. In Hungary, 55 sites were set up in primary and secondary care facilities, in pharmacies, and in malls across all regions, in both cities and villages. Out of 2766 individuals screened, 1286 participants (46.5%) had hypertension. Out of 1869 participants not on antihypertensive medication, 389 (20.8%) had elevated BP. In the case of treated individuals ($n = 897$), 420 (46.8%) had uncontrolled hypertension. Almost every 2nd subject of the screened cohort had hypertension (treated and controlled, treated and uncontrolled, or untreated). In the untreated cohort, every 5th subject had elevated BP, whilst among patients on antihypertensive medication, every second had uncontrolled BP. By identifying almost one-third of the whole screened cohort with the possibility of newly diagnosed or uncontrolled hypertension, our results confirm the importance of BP screening campaigns.

*Corresponding author. Tel: +36-1-464-8723, Fax: +36-1-464-8723, Email: jarzolmik@gmail.com

## Introduction

Cardiovascular (CV) diseases are the leading causes of mortality in Hungary. Between 2000 and 2012 CV mortality in both sexes decreased by about 30% in both age categories of 40–59 and 60–79 years, attributed to the reduction in the number of other ischaemic heart diseases and of other ischaemic heart diseases plus stroke, respectively.[1] However, compared with other European Union countries the mortality risk in Hungary is still very high. In 2017, Hungary was among the top four European Union countries with Lithuania, Latvia, and Slovakia in respect of ischaemic heart disease mortality with 286/100 000 deaths/year. Stroke mortality rates in Hungary are also amongst the highest in the European Union with values of 178/100 000 deaths/year in men and 127/100 000 deaths/year in women.[2]

The early diagnosis and the proper treatment of hypertension, as a major contributor to cardiovascular disease (CVD) mortality merits a high priority to improve the CV outcome of the Hungarian citizens. That is why the Hungarian Society of Hypertension had decided in 2017 to join May Measurement Month (MMM), the hypertension awareness campaign from the International Society of Hypertension (ISH). In the 1st year, 3967 subjects were involved and 2052 (51.8%) of them had hypertension. By identifying almost one-third of the screened cohort with the possibility of newly diagnosed or uncontrolled hypertension, the Hungarian data of MMM17 confirmed the importance of hypertension screening campaigns.[3] This publication provides the Hungarian data of MMM19.

## Methods

May Measurement Month is a cross-sectional survey planned and distributed worldwide by the ISH. The Hungarian co-ordinator was Zoltán Járai, the president of the Hungarian Society of Hypertension.

Prior to participation, all patients gave written informed consent. The study was approved by the Scientific and Research Ethics Committee of the Medical Research Council, the Hungarian Ministry of Health (ETT TUKEB 18736-2/2019/EKU) and was carried out in accordance with the tenets of the Declaration of Helsinki.

The survey was performed following the instructions from the ISH.[4] Sites were set up in primary and secondary care facilities, in pharmacies, and occasionally in shopping malls. Altogether 55 sites were involved. Target subjects were adult volunteers ($\geq$18 years), who ideally, had not had their blood pressure (BP) measured in the previous year, but subjects were not excluded on this basis.

Site leader physicians and assistants were recruited and trained by the Hungarian Society of Hypertension. The campaign was promoted by scientific newsletters of the society and through social media. Before the BP measurement, race and history of hypertension, diabetes, smoking, previous myocardial infarction, stroke, smoking, and alcohol consumption were recorded also with the data of height and weight. Number of antihypertensive medications, the regular use of statin or aspirin were also registered. Recommendation for standard methods included the measurement of brachial circumference for appropriate cuff size usage; left side measurement preferably; at least 5 min resting before measurements in the seated position; prohibition of smoking before and during the measurement; three consecutive measurements 1 min apart and the usage of automated oscillometric upper-arm cuff device preferably. The type of device was not registered. From the three registered BP values, the mean of the 2nd and 3rd was used in the calculations. Weight and height were asked to be also recorded for all patients either based on measurement or estimation by the subject. No additional measurements were in the protocol. Screening took place between 1st of May and 31st of May 2019.

From the 55 sites, data were uploaded online to the website of the MMM international co-ordinators or were collected by the headquarters of the Hungarian Society of Hypertension and without local cleaning were directly transferred to the MMM central statistical team. For those participants missing either the 2nd or 3rd BP measurement (or both), multiple imputations using chained equations were used to estimate the missing reading based on global data, to provide better comparison across all participants. Data were analysed centrally by the MMM project team.[4]

## Results

In total, 2766 Caucasian subjects were involved, the mean age was 47.8 (SD: $\pm$ 17.4) years. As data collection was incomplete for some of the variables in the study questionnaire, numbers used in different analyses vary.

Women were represented in higher proportion than men ($n = 1681$, 60.8% and $n = 1084$, 39.2%, respectively). Eight hundred and ninety-seven (32.4%) of the subjects were on ongoing antihypertensive medication. Two hundred and forty-five (8.9%) people of the whole cohort had diabetes, 80 (2.9%) had previous myocardial infarction, and 72 (2.6%) of them suffered stroke previously. Twenty women (1.2%) were pregnant at the time of the screening and 90 women (5.4%) reported hypertension in a previous pregnancy. Six hundred and sixty (23.9%) subjects were current smokers and 348 (12.6%) reported the consumption of alcohol once or more per week. The mean body mass index was 26.9 kg/m$^2$.

In respect of the BP statistics in the whole cohort, the mean BP was 128.5/80.2 mmHg. In those patients who were not on antihypertensive medication, the mean BP was 125.7/79.6 mmHg, while in those, who were on antihypertensive medication, it was 136.9/83.2 mmHg. Considering 140/90 mmHg as the threshold for BP control, 1286 (46.5%) of the subjects had controlled or uncontrolled hypertension. Among those patients who were not receiving antihypertensive medication ($n = 1869$), 389 (20.8%) were hypertensive. In case of treated hypertensive patients ($n = 897$), 420 (46.8%) of them had uncontrolled BP.

After adjustment for age and sex, significantly higher systolic and diastolic BPs were found in subjects with known hypertension and those receiving antihypertensive medication, while systolic BP was significantly higher in

those with a diagnosis of diabetes (Supplementary material online, *Figure S1*). Compared with those of healthy weight, overweight, and obese participants had significantly higher systolic and diastolic BPs (Supplementary material online, *Figure S2*).

## Discussion

As part of MMM 2019, a standardized multinational screening campaign of hypertension, 2766 subjects were screened in Hungary. More than half of the whole cohort had hypertension (treated or untreated). Every 5th untreated participant had elevated BP and almost every 2nd participant taking antihypertensive therapy had uncontrolled BP.

By identifying 809 subjects with the possibility of newly diagnosed or uncontrolled hypertension, which was 29.2% of the whole screened cohort, the Hungarian part of MMM19 once again demonstrated the important role of screening hypertension for primary and secondary prevention. With this number, the results of MMM17 were almost exactly reproduced, where this proportion was 30.2%.[3]

In Hungary, since 2010 a unique national CV screening programme is ongoing. A specially furnished lorry is moving throughout the country, in which different examinations are carried out. At the end of 2017, the screening truck had been to 1505 places, 135 879 people had participated in comprehensive screening and 124 557 people had relevant BP measurement, with 11 601 successful measurements in 2017.[5] In 2017, among those patients who reported being healthy, BP was elevated in 24.2% of women and in 39.2% of men. In patients with a history of hypertension, BP was uncontrolled in 55.2% and 63.8% in women and men, respectively. We suppose that the comparison of these results with the Hungarian MMM19 findings is inappropriate because of the divergent screening sites of MMM19. However, it is obvious that despite the relatively low number of subjects with abnormal BP in MMM19, a large proportion of the screened people was still found to be in the high BP range.

There are also some limitations when interpreting the results of the MMM screening campaign, as subjects were not randomly sampled, and samples are therefore not nationally representative. Furthermore, without further follow-up examinations of the BP, the proportion of white-coat and masked hypertension of the screened cohort is unknown.

In conclusion, the results of MMM19, in line with MMM17, point out the importance of hypertension screening at the population level in Hungary. Such campaigns can increase the awareness of hypertension that can lead to the improvement of CV outcome.

## Supplementary material

Supplementary material is available at *European Heart Journal Supplements* online.

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