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May Measurement Month 2021: an analysis of blood pressure screening results from Hungary

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Elevated blood pressure (BP) is the most important risk factor for cardiovascular diseases (CVDs), which are still the leading cause of mortality in Hungary. Therefore, screening programmes identifying subjects with hypertension have an important role in CVD prevention. In 2017, the International Society of Hypertension initiated May Measurement Month (MMM) aimed at raising awareness of elevated BP. Hungary joined the MMM campaigns in 2017, 2019, and 2021, and a summary of the results from 2021 is presented here. An opportunistic cross-sectional survey of volunteers aged ≥18 was carried out in September 2021. Measurement of BP, the definition of hypertension, and statistical analysis followed the standard MMM protocol. In Hungary, 30 sites were set up in primary and secondary care facilities, in pharmacies, and in malls. Both cities and villages were involved in all regions. A total of 1414 individuals were screened, and 558 subjects (39.5%) had hypertension. Out of 1065 participants not on antihypertensive medication, 209 (19.6%) had elevated BP. Among treated individuals ($n = 349$), 206 (59.0%) had controlled BP (<140/90 mmHg). Almost 40% of the participants had hypertension. Among untreated participants, one in five had elevated BP, while among patients on antihypertensive medication, 41% had uncontrolled BP. These results confirm the importance of screening of hypertension in untreated individuals and that efforts are required to adequately control BP in treated hypertensive patients.

Introduction

Cardiovascular diseases (CVDs) are still the leading causes of morbidity and mortality in Hungary. Although there has been significant improvement between 1990 and 2017 in ischaemic heart disease, with incidence declining from 227/100 000 to 160/100 000 in females and 439/100 000 to 278/100 000 in males, Hungary is still in the third and eighth worst position with the European Union for females and males, respectively.[1] Similarly, there has

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Table 1 Total participants and proportions with hypertension, awareness, on medication, and with controlled blood pressure

Total participants	Number (%) with hypertension	Number (%) of hypertensives aware	Number (%) of hypertensives on medication	Number (%) of those on medication with controlled BP	Number (%) of all hypertensives with controlled BP
1414	558 (39.5)	370 (66.3)	349 (62.5)	206 (59.0)	206 (36.9)

been a significant improvement in stroke incidence over the last three decades—decreasing from 194/100 000 to 126/100 000 in females and 250/100 000 to 161/100 000 in males; however, with these numbers, Hungary is still in the eighth and fifth worst position within the European Union, for females and males, respectively.[1]

The adequate management of CVD risk factors, especially hypertension, can have a major impact on the development of CVD complications. The Hungarian Society of Hypertension (HSH) joined May Measurement Month (MMM), the hypertension awareness campaign initiated by the International Society of Hypertension (ISH), during its first campaign in 2017. In 2017 and 2019, 51.8 and 46.5% of the screened population had hypertension.[2,3] The identification of almost one-third of the screened cohort having newly diagnosed or uncontrolled hypertension in both the 2017 and 2019 MMM campaigns in Hungary confirms the importance of the screening for hypertension.[2,3] Unfortunately, the COVID-19 pandemic foiled the worldwide campaign of MMM20. In this article, we present findings from the Hungarian MMM21 campaign.

Methods

The cross-sectional survey was planned and undertaken worldwide.[4] The Hungarian coordinator was Z.J., the president of the HSH. 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 18736-5/2019/EKU), and was carried out in accordance with the tenets of the Declaration of Helsinki.

The survey was performed following the MMM protocol.[4] Thirty sites were set up across primary and secondary care facilities, in pharmacies, and in a small number of shopping malls. Target subjects were adults (≥18 years), ideally those who had not had their blood pressure (BP) measured in the previous year.

Physicians and health care assistants were recruited and trained by the HSH as leaders of the screening sites. The campaign was promoted by scientific newsletters of the society and through social media. Prior to undertaking BP measurement, the MMM questionnaire was administered to collect information, including ethnicity, history of hypertension, diabetes, smoking, previous cardiovascular event, stroke, smoking, alcohol consumption, and height and weight. The number of antihypertensive medications being used and the regular use of statin or aspirin were also recorded. Compared with previous years, some new variables were also collected, including previous COVID-19 infection and vaccination, and the use of oral contraception or hormone replacement therapy. Standardized BP measurement was recommended, including the measurement of the brachial circumference for appropriate cuff size usage; left side measurement preferably; at least 5-min rest before measurements in seated position; prohibition of smoking before and during the measurement; three consecutive measurements 1 min apart; and the use of automated oscillometric upper-arm cuff device preferably, although the specific device used was not recorded. Three BP measurements were taken, with the mean of the second and third used in analysis. Hypertension was defined as a systolic BP ≥140 mmHg and/or a diastolic BP ≥90 mmHg (using the mean of the second and third BP readings) or being on treatment with at least one antihypertensive medication. Controlled BP was defined as a systolic BP <140 mmHg and a diastolic BP <90 mmHg among those on antihypertensive medication. Where any of the second or third BP readings were absent, these were imputed as described by the MMM 2019 protocol. Due to the COVID-19 pandemic, MMM allowed flexibility of when the campaign took place. In Hungary, the campaign was undertaken between 1 September and 30 September 2021.

All data were uploaded online to the MMM application or were collected by the headquarter of the HSH and were uploaded into the central database by the secretary of HSH. Data were analysed centrally by the MMM project team.[4] Linear regression analyses were conducted to investigate potential associations between each participant characteristics and mean systolic or diastolic BP. Regression analyses were adjusted for age, sex, and antihypertensive medication use and included only those individuals with complete data on these factors.

Results

A total of 1414 subjects were screened in Hungary during MMM21, with a mean age of 46.8 ± 17.4 years.

More women participated than men ($n = 870$, 61.5% and $n = 544$, 38.5%, respectively), and 1364 (96.5%) of participants were of White ethnicity. Three hundred and forty-nine (24.7%) of the subjects were currently using antihypertensive medication. Two hundred and thirty-one (16.3%) had previous positive COVID-19 test, and 1141 (80.7%) had at least one COVID-19 vaccination. One hundred eighteen (8.3%) people of the whole cohort had diabetes, 47 (3.3%) reported a previous myocardial infarction, and 34 (2.4%) had suffered a stroke previously. Ninety-seven women (11.1%) were pregnant at the time of the screening, and 37 women (4.3%) reported hypertension in a previous pregnancy. Sixty-six (7.6%) women were on hormonal contraception and 15 (1.7%) on hormone replacement therapy. Three hundred and thirteen (22.1%) subjects were current smokers, and 212 (15.0%) reported the consumption of alcohol once or more per week.

After imputation, the age–sex standardized mean BP for the whole cohort was 126.7/78.7 mmHg. In those patients who were not using antihypertensive medication, the age–sex standardized mean BP was 125.4/78.3 mmHg, while in those who were on antihypertensive medication, it was

135.7/83.4 mmHg. Of all participants, 558 (39.5%) were found to have hypertension, of whom 66.3% were aware of their status, 62.5% were on antihypertensive medication, and 36.9% had controlled BP (*Table 1*). Out of 1065 participants not on antihypertensive medication, 209 (19.6%) had elevated BP during the measurement.

Blood pressure changes with age showed different patterns in men and women, demonstrating higher systolic and diastolic BP in men below the age of 55 but similar BPs at ages above 55 years (see Supplementary material online, *Figure S1*). In linear regression analyses adjusted for age and antihypertensive medication, in women, the use of hormone replacement therapy was associated with lower systolic BP (9.04 mmHg lower, 95% Confidence Interval (CI): −16.26, −1.83, $P = 0.014$; see Supplementary material online, *Figure S2*).

Discussion

Hungary contributed data from 1414 subjects to MMM21, a standardized multinational screening campaign of hypertension; 39.5% of the whole cohort had hypertension (treated or untreated). Elevated BP was found in 20% of untreated participants and in 41% of those treated with antihypertensive medications.

By identifying 352 subjects with the possibility of newly diagnosed or uncontrolled hypertension, which was 24.9% of the whole screened cohort, the Hungarian MMM21 campaign once again demonstrated the important role of screening hypertension for primary and secondary prevention. This number is comparable with the Hungarian results of MMM17 and MMM19, where this proportion was 30.2 and 29.2%, respectively.[2,3]

In 2018, HSH initiated the Hungarian Hypertension Registry, which aims to assess the control rate of hypertension in Hungary, based on office BP data in General Practitioner (GP) practices and in outpatient clinics of cardiology and internal medicine. After 3 years, >3 million measurements have been made of which 55.6% fell in the hypertension range.[5] The registry data showed that repeated BP measurements in everyday practice are rare. We hypothesize that the higher proportion of patients with controlled BP in the Hungarian results of MMM21 is due to the opportunistic sampling used in the MMM screening, which is not nationally representative, and seasonal changes of BP could also have influenced the results.

The systolic BP changes with age observed among men and women in MMM21 differed from those reported by Ji *et al.*[6] who described repeated BP measurement in 32 833 subjects over four decades. These differences might be explained by the cross-sectional setup of the present study, differential selection processes, or by ethnic differences in the cohorts, but the exact explanation remains unclear.

There are also some limitations of the interpretation of the results of the MMM screening campaign, as subjects were not randomly sampled, and samples are not nationally representative. There is another limitation, as without an assessment of out-of-office BP, the proportion of white coat and masked hypertension of the screened cohort is unknown.

In conclusion, the results of MMM21 are consistent with the previous MMM17 and MMM19 campaigns and highlight the importance of hypertension screening at the population level in Hungary. Such campaigns can increase the awareness of hypertension and can lead to the improvement of CV outcomes.

Supplementary material

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

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Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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