

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

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Cardiovascular disease is not only the leading cause of mortality in Bulgaria, but the associated mortality rate is twice the European Union average, so screening programmes that identify subjects with elevated blood pressure (BP) are of utmost importance. May Measurement Month (MMM) is an annual global initiative that began in 2017 that aims to raise awareness of high BP. Bulgaria first joined the third campaign of MMM in 2019, and an overview of the results of Bulgarian participation in MMM21 is presented in this paper. Hypertension was defined as receiving BP-lowering medications or having a systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg. Statistical analysis followed the standard MMM protocol. In Bulgaria, 155 screening sites were set up in primary and secondary care facilities, in pharmacies, and outdoor spaces across 16 administrative districts. Out of 3908 individuals screened, 2896 participants (74.1%) had hypertension. Of 2896 participants with hypertension, 76.4% were on treatment of whom 48.5% had controlled BP ($<140/90$ mmHg). Out of 1696 participants not on antihypertensive medication, 684 (40.3%) had elevated BP. Men were found to have higher rates of undiagnosed hypertension and lower rates of control than women. By identifying almost two-thirds of the whole screened cohort with the possibility of newly diagnosed or uncontrolled hypertension, our results confirm the importance of BP screening.

Introduction

Despite the sustained decline in cardiovascular disease (CVD) mortality in many countries across Europe, it remains the most common cause of death within the region.¹ According to data from the e-atlas of the European Society of

Cardiology, four of the 13 middle-income countries in Europe demonstrated an increase in crude premature mortality rates (deaths under the age of 70 years) in females (Bulgaria, Egypt, Republic of Georgia, and Turkey) and six demonstrated an increase in males (Bulgaria, Egypt, Republic of Georgia, Romania, Serbia, and Turkey) from 2010 to the most recent year of data collection.² Overall life expectancy at birth in Bulgaria temporarily fell by 1.5 years in 2020 compared to 2019, largely due to

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the high number of deaths from the COVID-19 pandemic. Stroke (number of deaths 20 687; 19.3%), ischaemic heart disease (12 101, 11.3%), and lung cancer (3 341; 3.1%) are the leading causes of death and accounted for one-third of all deaths in 2018 in the country.³

The early diagnosis and the adequate treatment of hypertension as a major contributor to CVD mortality merit a high priority to improve the CV outcomes of Bulgarian citizens. That is why the Bulgarian Hypertension League decided to join May Measurement Month (MMM) in 2019—the hypertension awareness campaign initiated by the International Society of Hypertension (ISH).⁴ By identifying almost half of the screened cohort with the possibility of newly diagnosed or uncontrolled hypertension, the MMM19 data from Bulgaria confirmed the importance of hypertension screening campaigns.⁵ This publication provides results from the Bulgarian data from the MMM21 campaign.

Methods

May Measurement Month is a cross-sectional blood pressure (BP) survey initiated by the ISH. The Bulgarian coordinator for MMM21 was Dr Arman Postadzhiyan, the president of the Bulgarian Hypertension League. All of the campaign materials provided by ISH were translated into the Bulgarian language. The study was approved by the National Ethics Committee, and all the participants gave written informed consent. Sites were set up in primary and secondary care facilities, in pharmacies, and outdoor public spaces. We launched a campaign to promote MMM21 activities in the media and set up an internet site with all the promotional materials and link to an online survey. On World Hypertension Day, we organized a press conference and our leading hypertension experts appeared on radio and television broadcasts to raise BP awareness.

In total, 155 screening points in 16 of 28 administrative districts were involved in the MMM21 campaign. Medical students and trained physicians performed three sitting BP measurements using validated upper-arm oscillometric devices (OMRON M7 Intelli IT AFib). Meanwhile, we administered a standardized questionnaire to collect information on demographics, medical history, use of medication, smoking and alcohol consumption, and anthropometric characteristics. Hypertension was defined as using antihypertensive medication or having a systolic BP $\geq$ 140 mmHg or diastolic BP $\geq$ 90 mmHg, based on the mean of the second and third BP readings. For participants on antihypertensive medication, controlled BP was defined as both systolic BP < 140 mmHg and diastolic BP < 90 mmHg. Individuals with hypertension (HTN) or uncontrolled BP were provided with

printed dietary and lifestyle advice and recommendations to visit their GP or dedicated hypertension centres. Collected data were analysed centrally by the MMM project team, and multiple imputation was performed to estimate the mean of the second and third readings where they were missing.⁶

Results

In total, 3908 Caucasian individuals were screened, all of whom were participating in MMM for the first time. Of those, 1283 (32.8%) had their latest BP measured within the previous 12 months, while 364 (9.3%) reported never having had their BP measured. The mean age of screened participants was 62 (SD $\pm$ 14.3) years. A total of 62.7% were female, and among them, 1.7% reported a history of hypertension in a previous pregnancy. About 835 (21.4%) respondents were current smokers and 666 (17%) reported alcohol consumption of one or more drinks per week. History of stroke was present in 242 (6.2%) and diabetes in 458 (11.7%) participants.

Data for three BP measurements were available for 3907 individuals. Blood pressure decreased on average by 4.8/6.3 mmHg between the first and third readings. In the whole cohort, the mean values of the second and third readings were 135.8/82.4 mmHg. In those patients who were not on antihypertensive medication, the mean BP was 131.9/82.2 mmHg, while in those, who were on antihypertensive medication, it was 138.8/82.5 mmHg (see [Supplementary material online, Table S1](#)).

After imputation, 2896 participants (74.1%) had hypertension and 2 389 (82.5%) of them were aware of their high BP. Of participants with hypertension, 2212 (76.4%) were on antihypertensive medication, and of those where the number of medication classes was known, 49.6% were taking a single medication, 26.5% on two, 18.2% on three, and 5.7% on four or more medications. Only 48.5% of those on medication had controlled BP with a corresponding control rate of 37.0% of all patients with hypertension ([Table 1](#)). Among those patients who were not receiving antihypertensive medication ($n = 1\,696$), 684 (40.3%) were hypertensive. The highest proportion of untreated (32.0%) and inadequately treated hypertension (60.2%) were noticed in male participants, with the corresponding percentages in females being 18.5% and 47.2%, respectively (see [Supplementary material online, Table S2](#)). At the time of screening 562 (14.4%), participants reported taking statins and 571 (14.6%) reported aspirin use.

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

	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
Total participants 3908	2896 (74.1%)	2389 (82.5%)	2212 (76.4%)	1072 (48.5%)	1072 (37%)
Female 2452	1794 (73.2%)	1561 (87.0%)	1463 (81.5%)	773 (52.8%)	773 (43.1%)
Male 1454	1100 (75.7%)	827 (75.2%)	748 (68.0%)	298 (39.8%)	298 (27.1%)

A unique feature of the MMM21 campaign was the collection of data during the COVID-19 pandemic. A previous positive COVID-19 test was reported in 204 (5.2%) participants and vaccination in 472 (12.1%). After adjustment for age, sex, and antihypertensive treatment, numerically lower systolic and diastolic BPs were found in subjects with previous positive test and vaccination (see [Supplementary material online, Table S3](#) and [Supplementary material online, Figure S1](#)).

Discussion

The MMM21 campaign represents the largest BP screening campaign so far in Bulgaria, with 3908 participants included.

More than half of the whole cohort had hypertension (treated or untreated). Around 40% of untreated participants had elevated BP, and almost half of the participants on antihypertensive medication had uncontrolled BP. We identified 684 subjects with possible undiagnosed HTN and 1140 inadequately treated subjects, which represents a total of 71.3% of the screened cohort. Men had lower rates of hypertension diagnosis and control rates than women, and young individuals lower than older ones. Half of treated hypertensives were on monotherapy, and concomitant use of lipid lowering therapy was <20%, especially in the patient population without CVD. These findings suggest a high level of medical inertia in intensifying treatment for achieving optimal control. Due to methodological limitations and opportunistic sampling, as well as the high average age of individuals screened, the sample cannot be considered representative of the entire Bulgarian population. Nevertheless, this is a large sample, and the obtained data are in line with reports from other European populations and with the available epidemiological studies conducted in the country.^{4,5}

In conclusion, there is considerable potential for improving the control of hypertension in the general population in Bulgaria. The MMM data should be used to encourage healthcare policymakers to implement health campaigns and screening programmes at the population level, and specifically target working-age individuals and men in whom undiagnosed hypertension is more common. Training programmes are also needed for practicing doctors to help to improve patient compliance and intensify the treatment

of hypertension and other cardiovascular risk factors until optimal control is achieved.

Supplementary material

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

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Conflict of interest: none declared.

Data availability

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

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