

## May Measurement Month 2022: an analysis of blood pressure screening results in Greece

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## KEYWORDS

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Control

Hypertension remains a major public health challenge with inadequate control globally. The May Measurement Month (MMM) global survey initiated by the International Society of Hypertension was implemented in Greece in 2022 aiming to raise hypertension awareness and control. Adult volunteers were recruited through opportunistic screening in 11 urban areas. Information on medical history and three sitting blood pressure (BP) measurements were obtained using validated automated upper-arm devices, and the data were submitted online through a custom-designed app of the global MMM survey. Hypertension was defined as average systolic BP at least 140 mmHg and/or diastolic 90 mmHg, and/or self-reported use of drugs for hypertension. A total of 6353 individuals were included (mean age  $54.8 \pm 16.2$  years, 49% men, 30.5% current smokers, 11.5% had diabetes, 5.1% cardiovascular disease). The prevalence of hypertension (42.6%) was higher in men (48.8%) and in older individuals (74%). Among individuals with hypertension, 27.5% were unaware of their diagnosis, 22.2% were treated but uncontrolled ( $\geq 140$  mmHg systolic and/or  $\geq 90$  mmHg diastolic BP), and 47.9% were treated and controlled. Among treated hypertensives, 58.2% were on monotherapy and at least one-third of them were uncontrolled. The prevalence of hypertension in Greece seems to be high and is often undiagnosed, untreated, and uncontrolled. Public health initiatives and campaigns aiming at improving hypertension diagnosis and control need to be implemented.

## Introduction

Hypertension remains a major global public health concern, as it is a strong, modifiable risk factor for cardiovascular disease, yet awareness, treatment, and control are still insufficient.<sup>1</sup> In Greece, the national epidemiological survey EMENO (2013-16) showed high prevalence of hypertension at 39.6%, with 31.8% of hypertensives being undiagnosed, 65.5% treated, and only 30.5% controlled.<sup>2</sup> The May Measurement Month (MMM) survey, initiated by the International Society of Hypertension, aims to screen for hypertension, raise awareness, and improve control through large-scale opportunistic blood pressure (BP) measurements in the general population worldwide.<sup>1</sup> In 2019, MMM was conducted in Greece for the first time, identifying 2382 hypertensive patients, of whom 21.3% were unaware of their diagnosis.<sup>3</sup> This article reports the findings of the MMM survey in Greece in 2022.

## Methods

The MMM 2022 survey in Greece was organized by the Hellenic Society of Hypertension in 11 urban areas (Athens, Thessaloniki, Patra, Heraklion, Volos, Ioannina, Chania, Kavala, Lamia, Tripoli, and Kalamata). The sample selection was opportunistic, with voluntary participation of adults in the screening sites. Screening sites were set up in indoor or outdoor public spaces. Trained physicians collected information on medical history and performed three sitting BP measurements using validated automated oscillometric upper-arm devices Omron M3 HEM-7154-E (Omron Kyoto, Japan).<sup>4</sup> Medical students also participated after training and with physician supervision. Data

were submitted online through tablets or smartphones using the custom-designed app of the MMM survey. Once submitted, investigators could not modify or review the data but received a unique ID to track submissions per tablet. The app included mandatory fields eliminating missing data. Local principal investigators could monitor submission counts per sampling point in real time via an online platform, but individual data were not visible until the end of the survey. The average of the last two BP readings was analysed.<sup>5</sup> Hypertension was defined as systolic BP  $\geq 140$  mmHg and/or diastolic  $\geq 90$  mmHg, and/or self-reported use of drugs for hypertension. The Ethics Committees of the National Drug Organisation and of the Athens University School of Medicine were informed about the survey. A custom STATA code was developed to automate data cleaning, analysis, and reporting, ensuring objectivity and efficiency. This code was designed by A.M. to be reusable for repeat annual MMM data analyses, allowing for consistent data processing.  $\chi^2$  tests were used to assess differences in categorical variables and *t*-tests for continuous variables. The analysis was performed using STATA software (version 13.0; Stata Corp, College Station, TX) with two-sided  $P < 0.05$  considered statistically significant.

## Results

A total of 6373 individuals were recruited, 20 with missing data were excluded, and 6353 with complete data were analysed (Ioannina 15.8%, Thessaloniki 15.3%, Athens 13.5%, Heraklion 11.7%, Tripoli 8.3%, Chania 7.9%, Kalamata 7.2%, Kavala 6.7%, Patra 6.1%, Volos 5.4%, and Lamia 2.2%). The mean age of participants was  $54.8 \pm 16.2$  years, 49% were male, 30.5% current smokers, 11.5% with diabetes, 5.1% with cardiovascular disease, and mean BP was  $124.5 \pm 17.1/77.5 \pm 10.5$  mmHg ( $\pm$ SD; systolic/diastolic).

**Table 1** Prevalence, awareness, treatment, and control of hypertension according to age and sex

Age (years)	N (%)	Hypertension prevalence (%)	Untreated unaware (%)	Untreated aware (%)	Treated uncontrolled (%)	Treated controlled (%)
18-29	586 (9.2)	5.1	96.6	0.0	0.0	3.4
30-39	520 (8.2)	11.7	72.1	4.9	9.8	13.1
40-49	1094 (17.2)	27.1	60.1	5.7	11.8	22.3
50-64	2225 (35.0)	44.9	29.5	3.7	21.1	45.6
65-79	1611 (25.4)	67.6	15.8	0.6	25.3	57.9
≥80	317 (5.0)	74.0	12.0	0.4	30.5	56.7
<i>P</i> <sup>a</sup>		<0.001	<0.001	<0.05	<0.001	<0.001
Sex						
Men	3099 (48.8)	48.8	30.2	2.5	22.8	44.3
Women	3219 (50.7)	34.6	23.6	2.3	21.1	52.7
<i>P</i> <sup>a</sup>		<0.001	<0.001	NS	NS	NS
Total	6353 (100)	42.6	27.5	2.4	22.2	47.9

<sup>a</sup>*P*-values among age groups and sex comparison in each column.

**Table 2** Blood pressure levels and hypertension control according to the number of antihypertensive drugs (data from 1892 treated individuals)

Number of drugs	Patients (N, %)	Systolic BP (mean ± SD, mmHg)	Diastolic BP (mean ± SD, mmHg)	Uncontrolled hypertension (≥140/90 mmHg)
1	1101 (58.2)	129.6 ± 17.2	78.7 ± 10.7	30.2%
2	601 (31.7)	132.5 ± 16.8	77.8 ± 11.3	34.1%
3	164 (8.7)	133.3 ± 17.6	77.2 ± 10.1	32.9%
≥4	26 (1.4)	140.8 ± 19.1	75.8 ± 12.2	34.6%
	1892 (100%)	<i>P</i> < 0.001	<i>P</i> < 0.001	<i>P</i> = NS

The prevalence of hypertension was 42.6% and increased with older age, reaching 74% among those aged ≥80 years (Table 1). Among individuals with hypertension, 27.5% were undiagnosed, 29.9% untreated, and 52.2% uncontrolled (treated or untreated) (Table 1). Men had higher prevalence of hypertension and higher rates of unaware, untreated, and uncontrolled hypertension than women (Table 1). Younger individuals were less likely than older ones to have hypertension and less likely to be diagnosed, treated, and controlled (Table 1).

Among treated hypertensives, 58.2% were on monotherapy, and with an increasing number of antihypertensive drugs, the systolic BP levels were higher and hypertension control rate lower (Table 2). Treated controlled hypertensives had higher systolic BP than normotensives, with the difference in diastolic BP being clinically unimportant (122.5 ± 11.7/74.1 ± 8.2 vs. 116.7 ± 12.1/74.2 ± 8.0; systolic/diastolic BP; *P* < 0.001/<0.001).

## Discussion

The main findings of the MMM 2022 survey in Greece are: (i) the prevalence of hypertension among adults was high (42.6%), (ii) men had a higher rate of hypertension than women, (iii) younger participants and men had higher

rates of undiagnosed and uncontrolled hypertension than older participants and women, respectively, and (iv) approximately one-third of hypertensive patients on monotherapy were uncontrolled.

It should be noted that these data are based on one set of three readings taken on opportunistic screenees and one set of repeated measurements is needed for a reliable diagnosis. However, this survey highlights the persistent burden of hypertension in Greece, which is consistent with the previous national surveys, but is higher than the global MMM findings.<sup>1,6</sup> The high proportion of undiagnosed and uncontrolled hypertension, particularly among men and younger adults, underscores the ongoing challenge of hypertension awareness and management. Notably, a substantial proportion of treated hypertensive patients had uncontrolled hypertension, using a conservative definition (≥140/90 mmHg), and/or were on a single BP lowering drug agent, suggesting potential clinical inertia among healthcare professionals in intensifying treatment to achieve optimal control.

These findings reinforce the need for implementing additional public health initiatives at national level to enhance hypertension diagnosis in the general population. Training programmes are also needed for practising doctors to improve the control rate of treated hypertensives.

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**Conflict of interest:** G.S.S. has received lecturer and consultation fees from Omron Healthcare Japan & Europe. There is nothing to declare by other authors.

## Data availability

Data are not publicly available but access can be requested with permission from the MMM Management Board, on request through the MMM website: [maymeasure.org](http://maymeasure.org).

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