

Opportunistic screening for hypertension in the general population in Greece: International Society of Hypertension May Measurement Month 2019

George S. Stergiou^{1*}, Ariadni Menti¹, Michael Doulas², Eugenia Gkaliagkousi³, Charalampos Grassos⁴, Rigas G. Kalaitzidis⁵, Manolis S. Kallistratos⁶, Vasiliki Katsi⁷, Xenophon Krokidis⁸, Thomas Makris⁹, Efstathios Manios¹⁰, Athanasios Manolis⁶, Maria Marketou¹¹, John A. Papadakis¹², Dimitrios Papadopoulos¹³, Athanasios Protogerou¹⁴, Michail Chatzopoulos¹, Pantelis Sarafidis¹⁵, Costas Tsioufis⁷, and Pantelis Zebekakis¹⁶

¹Hypertension Center STRIDE-7, National and Kapodistrian University of Athens, Third Department of Medicine, Sotiria Hospital, 152 Mesogion Avenue, Athens 11527, Greece

²Second Propedeutic Department of Medicine, Aristotle University of Thessaloniki, Hippokration Hospital, 49 Konstantinoupoleos, Thessaloniki 54642, Greece

³Third Department of Medicine, Aristotle University of Thessaloniki, Papageorgiou Hospital, Ring Road N. Efkarpia, Thessaloniki 56403, Greece

⁴Cardiology Department, General Hospital of Attica "KAT", 2 Nikis street, Athens 14561, Greece

⁵Department of Nephrology, University Hospital of Ioannina, 1 Stavrou Niarchou Avenue, Ioannina 45500, Greece

⁶Department of Cardiology, Asklepeion Hospital, 1 Vasileos Pavlou Avenue, Athens 16673, Greece

⁷Cardiology Department, Hippokration Hospital, 114 Vasilissis Sofias Avenue, Athens 11527, Greece

⁸Department of Medicine, Hospital of Kavala, Agios Syllas, Kavala 65500, Greece

⁹Department of Cardiology, Helena Venizelou Hospital, 2 Elenas Venizelou Avenue, Athens 11521, Greece

¹⁰Department of Clinical Therapeutics, National and Kapodistrian University of Athens, Alexandra Hospital, 4-2 Lourou Avenue, Athens 11528, Greece

¹¹Department of Cardiology, University Hospital, Panepistimiou Avenue, Heraklion 71500, Greece

¹²Department of Medicine, University Hospital, Panepistimiou Avenue, Heraklion 71500, Greece

¹³Department of Cardiology, Laiko Hospital, 17 Agiou Thoma street, Athens 11527, Greece

¹⁴Department of Pathophysiology, Cardiovascular Prevention & Research Unit, National & Kapodistrian University of Athens, 75 Mikras Asias street, Athens 11527, Greece

¹⁵Department of Nephrology, Aristotle University of Thessaloniki, Hippokration Hospital, 49 Konstantinoupoleos, Thessaloniki 54642, Greece

¹⁶First Department of Internal Medicine, Aristotle University of Thessaloniki, AHEPA Hospital, 1 Stylponos Kyriakidi, Thessaloniki 54636, Greece

KEYWORDS

Hypertension;
Blood pressure;
Screening;
Control

Hypertension remains a major public health issue with inadequate control worldwide. The May Measurement Month (MMM) initiative by the International Society of Hypertension was implemented in Greece in 2019 aiming to raise hypertension awareness and control. Adult volunteers (≥ 18 years) were recruited through opportunistic screening in five urban areas. Information on medical history and triplicate sitting

* Corresponding author. Tel: +30 2107763117, Email: gstergi@med.uoa.gr

blood pressure (BP) measurements were obtained using validated automated upper-arm devices. Hypertension was defined as systolic BP ≥ 140 mmHg and/or diastolic ≥ 90 mmHg, and/or self-reported use of drugs for hypertension. A total of 5727 were analysed [mean age 52.7 (SD 16.6) years, men 46.5%, 88.3% had BP measurement in the last 18 months]. The prevalence of hypertension was (41.6%) and was higher in men and in older individuals. Among individuals with hypertension, 78.7% were diagnosed, 73.1% treated, and 48.3% controlled. Awareness, treatment, and control of hypertension were higher in women and in older individuals. Hypertensives had a higher body mass index (BMI) and were more likely to have diabetes, myocardial infarction and stroke, and less likely to smoke than normotensives (all $P < 0.001$). Among treated hypertensives, 65.1% were on monotherapy, and with increasing number of antihypertensive drugs the BP levels were higher and hypertension control rates lower. The prevalence of hypertension in Greece is high, with considerable potential for improving awareness, treatment, and control. Screening programmes, such as MMM, need to be widely implemented at the population level, together with training programmes for healthcare professionals aiming to optimise management and control.

Introduction

Hypertension remains a major public health issue worldwide as it is a strong modifiable risk factor for cardiovascular disease and its awareness, treatment, and control remain inadequate.¹ Recent national epidemiological data in Greece showed high prevalence of hypertension at 39.6%, with 31.8% of hypertensives being undiagnosed, 65.5% treated and only 30.5% controlled.² The May Measurement Month (MMM) campaign by the International Society of Hypertension is a global initiative aiming to increase awareness of hypertension at population level and eventually improve its control.¹ MMM 2017, 2018, and 2019 screened more than 4 million adults in more than 100 countries, many of whom had never had a previous blood pressure (BP) measurement.¹ This article presents the first MMM data in Greece collected through opportunistic screening in May 2019.

Methods

MMM 2019 in Greece was organised by the Hellenic Society of Hypertension in five urban areas. Screening sites were set up in indoor public spaces and adult volunteers (≥ 18 years) were invited to participate. Trained physicians collected information on medical history and performed triplicate sitting BP measurements using validated upper-arm oscillometric devices Omron M3 HEM-7131-E.³ The average of the last two readings was analysed. Hypertension was defined as systolic BP ≥ 140 mmHg and/or diastolic ≥ 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. Analysis was performed using SPSS Statistics 25. Chi-square tests and analysis of variance were used to analyse categorical and continuous variables, respectively. The study data are

available from the corresponding author (GSS) upon reasonable request.

Results

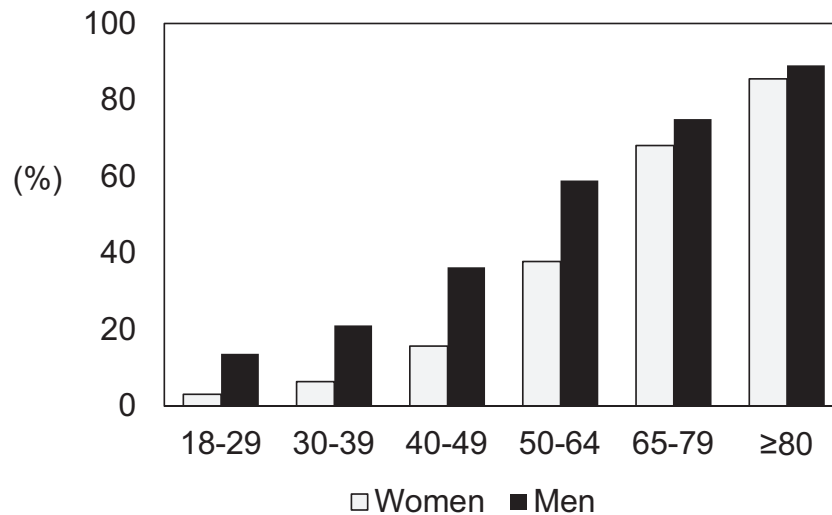
A total of 5848 individuals were recruited and 121 were excluded due to missing data (age, sex, BP measurements, hypertension awareness, treatment). The analysis included 5727 adults (Athens 26.0%, Heraklion 26.0%, Thessaloniki 24.0%, Ioannina 19.0%, Kavala 6.0%). The mean age was 52.7 years (SD 16.6), 46.5% were men and 88.3% had their BP measured within the last 18 months (98.1% in the last decade). Thirty percent were treated for hypertension, 26.4% for dyslipidemia and 9.0% received aspirin. Three BP readings were available in 91.0% and two in 9.0%.

The prevalence of hypertension was 41.6% and was increased with ageing, exceeding 85.0% in those ≥ 80 years (*Table 1* and *Figure 1*). Among individuals with hypertension, 78.7% were diagnosed, 73.1% treated, and 48.3% controlled (*Table 1*). Hypertensive individuals were older than normotensives (62.5 and 45.7 years, respectively), and more likely to be men (50.9% and 33.6%), to have a BMI > 25 kg/m² (76.8% and 50.9%), to drink frequently (12.6% and 10.9%), to have diabetes (23.0% and 4.1%), myocardial infarction (7.0% and 1.3%), stroke (3.6% and 0.6%), and less likely to smoke (21.5% and 27.0%) (all $P < 0.001$). Men had higher prevalence of hypertension (*Figure 1*), and higher rate of unaware, untreated and uncontrolled hypertension than women (*Table 1*). Younger individuals were less likely than older ones to have hypertension, but less likely to be diagnosed, treated, and controlled (*Table 1*).

Among treated hypertensives, 65.1% were on monotherapy, and with increasing number of antihypertensive drugs the BP levels were higher and hypertension control rate lower (*Table 2*). Controlled hypertensives had higher systolic BP than normotensives ($P < 0.001$). Hypertensives with cardiovascular disease (9.7%) were more likely than

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

Age	N (%)	Hypertension prevalence (%)	Untreated unaware (%)	Untreated aware (%)	Treated uncontrolled (%)	Treated controlled (%)
Total	5727	41.6	21.3	5.6	24.8	48.3
18-29	554 (9.7)	7.6	71.4	19.0	7.1	2.4
30-39	773 (13.5)	13.1	46.5	19.8	16.8	16.8
40-49	1152 (20.1)	25.9	46.6	13.8	17.8	21.8
50-64	1712 (29.9)	46.6	24.5	6.1	23.3	46.0
65-79	1244 (21.7)	71.6	8.9	1.3	27.4	62.4
≥80	292 (5.1)	87.7 ^a	7.0 ^a	1.2 ^a	34.4 ^a	57.4 ^a
Men	2663 (46.5)	50.9	22.9	6.9	27.4	42.8
Women	3064 (53.5)	33.6 ^d	19.2 ^b	3.9 ^c	21.3 ^d	55.6 ^d

^a*P* < 0.001 among age subgroups;^b*P* < 0.05;^c*P* < 0.01;^d*P* < 0.001 vs. men.**Figure 1** Prevalence of hypertension according to age and sex.**Table 2** Blood pressure levels (systolic/diastolic) and hypertension control according to the number of antihypertensive drugs

Number of drugs	Patients N (%)	Blood pressure (mmHg)	Uncontrolled hypertension %
1	1135 (65.1)	130.0/77.9	31.5
2	445 (25.5)	132.1/78.2	36.6
3	135 (7.7)	135.6/76.7	42.2
≥4	29 (1.7)	142.9/82.0	48.3
	1744 (100)	<i>P</i> < 0.001/NS	<i>P</i> < 0.01

NS, not significant

those without to have controlled BP (67.0% and 46.3%, respectively) and to receive lipid-lowering drugs (79.6% and 42.6%) or aspirin (55.7% and 12.0%) (all *P* < 0.01).

Discussion

The MMM project is a cost-effective campaign, aiming to improve the awareness and eventually control of hypertension at population level. MMM-Greece showed similar prevalence of hypertension as in MMM-Europe, which however is higher than in global MMM.¹ Interestingly, the prevalence of hypertension, as well as its association with age and sex were similar in MMM-Greece as in a recent national epidemiological study.²

Eighty percent of the MMM-Greece participants with hypertension were diagnosed (most of them treated) and about half were controlled, which gives a better picture of hypertension management in Greece than recent epidemiological data.² However, most of the MMM-Greece participants had their BP measured within the last 18 months, which implies that people who care about their health were recruited. Men had lower rates of hypertension diagnosis and control than women, and young individuals lower

than older ones, which is in line with previous reports.² These data should be interpreted by considering that in Greece the national healthcare system provides insurance to almost the entire population with medicines being highly subsidised.

Two-thirds of treated hypertensives were on monotherapy and 32.0% of them were uncontrolled. Moreover, subjects receiving more antihypertensive drugs had worse hypertension control. Among hypertensives with cardiovascular disease, 33.0% had uncontrolled BP, 20.4% did not receive lipid-lowering drugs, and 44.3% did not receive aspirin. These findings suggest poor patient adherence to therapy and inertia by practising doctors in intensifying treatment for achieving optimal control.

In conclusion, there is considerable potential for improving the control of hypertension in the general population in Greece. The MMM data should be used to press healthcare policymakers for implementing health campaigns and screening programmes at population level, and specifically targeted working-age individuals and men in whom undiagnosed hypertension is more common. Training programmes are also needed for practising doctors to help to improve patient compliance and intensify the treatment of hypertension and other cardiovascular risk factors until optimal control is achieved.

Acknowledgements

Sincere thanks to many volunteer investigators, Hellenic Society of Hypertension staff, medical students, and all participants.

Funding

Hellenic Society of Hypertension, Elpen Greece, Menarini Greece, Servier Greece. Omron Hellas, Leoussis SA, Greece donated 25 blood pressure monitors.

Conflict of interest: G.S.S. has received lecturer and consultation fees by Omron Healthcare Japan & Europe. Nothing to declare by other authors.

References

1. Beaney T, Schutte AE, Stergiou GS, Borghi C, Burger D, Charchar F, Cro S, Diaz A, Damasceno A, Espeche W, Jose AP, Khan N, Kokubo Y, Maheshwari A, Marin MJ, More A, Neupane D, Nilsson P, Patil M, Prabhakaran D, Ramirez A, Rodriguez P, Schlaich M, Steckelings UM, Tomaszewski M, Unger T, Wainford R, Wang J, Williams B, Poulter NR; MMM Investigators. The global blood pressure screening campaign of the International Society of Hypertension. *Hypertension* 2020;**76**: 333-341.
2. Stergiou GS, Menti A, Kalpourtzi N, Gavana M, Vantarakis A, Chlouverakis G, Hajichristodoulou C, Trypsianis G, Voulgari PV, Alamanos Y, Karakosta A, Touloumi G. Prevalence, awareness, treatment and control of hypertension in Greece: EMENO National Epidemiological Study. *J Hypertens* 2020 Nov 24. Online ahead of print.
3. STRIDE BP. Blood pressure monitors. www.stridebp.org/bp-monitors (1 March 2020).