

Untreated, unaware hypertensive patients, in Greece; A persistent phenomenon that significantly burdens public health

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ABSTRACT

In Greece, hypertension is a common health condition, affecting a substantial percent (around 40%) of the adult population. Moreover, the unaware, the untreated, and the treated but uncontrolled patients with hypertension constitutes a substantial sub-sample with serious public health burden. In this article we aimed to capture the picture of the fiscal burden of hypertension in Greece, including the cost based on the Disability Adjusted Life Years (DALYs) lost and to discuss the potential public health benefits that could be gained from improvements in the management of hypertension according to the recent guidelines.

KEY WORDS: Hypertension, high blood pressure, out of office blood monitoring

Global trends in the epidemiology of hypertension

According to the most recent epidemiological data, hypertension is a serious health problem that affects a significant proportion of the population around the world. According to the World Health Organization reports (2022), it is estimated that 1.28 billion adults, aged 30–79 years worldwide have hypertension; of them, more than 65% are living in low- and middle-income countries.^{1,2} The number of people aged 30–79 years with hypertension doubled from 1990 to 2019; from 331 million women (95% credible interval 306 to 359 million) and 317 million men (95%CI 292 to 344 million) in 1990, to 626 million women (95%CI 584 to 668 million) and 652 million men (95%CI

604 to 698 million) in 2019.² Of crucial importance is that only 46% of adults with hypertension are unaware of their condition. Moreover, only 42% of the adults with high blood pressure levels are diagnosed and treated; and, of those treated, 1 in 5 adults (i.e., 21%) manage to control their blood pressure levels.² Masked, white-coat, and uncontrolled hypertension are serious health issues, as they substantially increase the risk for coronary heart disease, heart failure, stroke, as well as kidney disease. Therefore, emerging actions should be made to effectively tackle this public health threat.³

Epidemiology of hypertension in Greece

In Greece, hypertension is a common health condition, affecting a substantial percent of the adult population. Based on the results of a cross-sectional, nationwide study, the National Survey of Morbidity and Risk Factors (EMENO) study, that recruited 4,699 men and women [mean (SD) age 49.2 (18.6) years] from various areas in Greece, between

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Submission: 22.06.2023, Acceptance: 13.07.2023

2013-2016, the prevalence of hypertension was found 42.7% in men and 36.5% in women ($p < 0.001$). Moreover, among patients with hypertension, 39.2% of men and 23.6% of women were unaware of their condition ($p < 0.001$), 2.7% were aware but untreated, 32.1% of men and 38.3% of women were treated but uncontrolled ($p < 0.01$) and 25.8% of men and 35.6% of women were treated and controlled ($p < 0.001$).⁴ The EMENO study confirms previous reports from the Attica Study, that was conducted in Athens metropolitan area in 2001-2002, and enrolled 3,042 men and women without any evidence of cardiovascular (CVD), or cancer [mean (SD) age 44.5 (14.2) years]; Attica study's participants were followed-up through detailed clinical evaluations, at 5 years (in 2006), 10 years (in 2012) and 20 years (in 2022) after enrolment. At baseline examination in 2002, the prevalence of hypertension was found 38.2% in men and 23.9% in women ($p < 0.05$), i.e., 4% and 13% lower as compared to the rates observed by EMENO study 10 years after, respectively. Moreover, 65% of men and 40% of women of the ATTICA Study with hypertension were untreated, and of those who were treated, only, 34% were adequately controlled. Thus, only 15% of the hypertensive population were well controlled in 2000s, i.e., almost the half of the well-controlled hypertension rate observed by EMENO study investigators 10 years after.⁵ Ten and 20 years after the baseline examination, i.e., in 2012 and 2022 follow-up examinations, the prevalence of hypertension among the Attica study participants increased to 55% and 49%, respectively.⁵ In Figure 1, the evo-

lution of hypertension prevalence in Greece is presented. Moreover, during the 2002-2022 period the incidence of hypertension progressively increased from 143 men and 134 women per 1,000 participants in 2006, to 292 men and 264 women per 1,000 participants in 2012, and to 505 men and 495 women per 1,000 participants in 2022. Of them, 85% of men and 75% of women with hypertension were on special pharmaceutical and/or dietary treatment; 34% of men and 32% of women with hypertension were found to be uncontrolled in 2022, rates that are in line with the EMENO study results few years earlier.

It seems that only one third of Greek adults with hypertension achieves the goals of blood pressure levels, a fact that requires emerging attention by the health authorities. In this article we aim to capture the picture of the fiscal burden of hypertension in Greece, including the cost based on the Disability Adjusted Life Years (DALYs) lost – a measure that includes both years of life lost due to premature mortality and years of life with disability due to hypertension. In addition, we aim to discuss the potential public health benefits that could be gained from improvements in the management of hypertension according to the recent guidelines. The role of blood pressure monitoring will be also discussed in the light of the most effective approaches in determining individuals at high risk for CVD.

Fiscal Burden of Hypertension in Greece

Hypertension contributes significantly to the overall economic burden of chronic diseases in Greece. Accord-

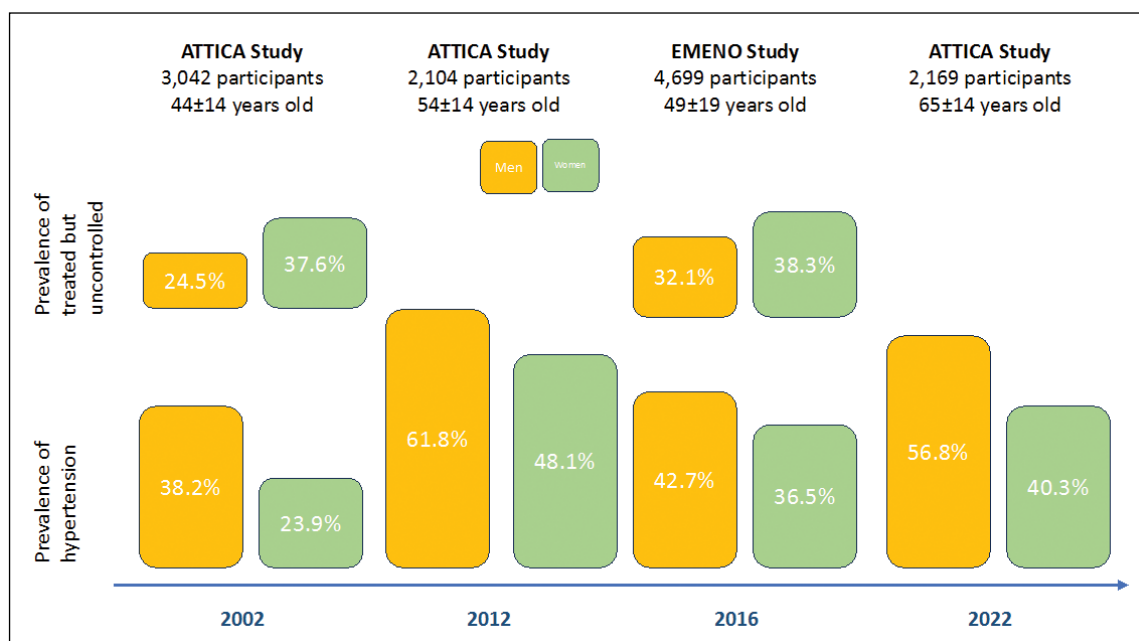


FIGURE 1. The evolution of hypertension, and its management in Greece, between 2002-2022.

ing to a study carried out by Athanasakis et al.,⁷ the total financial burden due to hypertension in Greece amounts to approximately 3 billion euros, which was approximately 1.6 % of the country's Gross Domestic Product (in 2014). Moreover, according to the same study the average direct cost per mmHg lowering of blood pressure levels was 13.7 euros (standard deviation 14.2), whereas the direct average annual cost per patient with hypertension who controlled the blood pressure levels was estimated to be 603.1 euros (standard deviation 215). In a subsequent analysis, Athanasakis et al., aimed to quantify the economic benefits of achieving optimal systolic blood pressure levels.⁸ Based on a Markov model projecting 10-year health outcomes and costs, the scenario which assumed that all individuals with hypertension in Greece will achieve optimal systolic blood pressure (i.e., < 140 mmHg), as compared to the current situation that 33% were uncontrolled, would lead to the reduction of the occurrence by 80 non-fatal CVD events and 61 deaths per 1,000 men smokers, and by 59 and 37 cases per 1,000 men non-smokers, respectively. The figures for women were 69 and 57 cases per 1,000 women smokers, and by 52 and 28 cases per 1,000 women non-smokers. Thus, as it was estimated the corresponding health expenditures could be reduced by approximately 83 million euros per year.⁸

Beyond the effect of hypertension on CVD morbidity and mortality, the cost of DALYs due to hypertension is also of major importance as it gives another view of this health problem, closer to real life conditions. According to the Global Burden of Disease (GBD) 2019 Risk Factors Collaborators, high blood pressure accounts for 9.3% of total DALYs in men and women of all ages, making hypertension the leading risk factor for CVDs, worldwide; in addition, focusing on those aged 75+ years old, high blood pressure accounts for 19.5% of total DALYs, underlying the crucial role hypertension plays especially under the perspective of future demographic trends regarding population aging.⁹ Regarding Greece and based on the GBD 2019 Risk Factors Collaborators study report, the total DALYs of the entire population for 2019, due to all-cause morbidity and mortality, were estimated 1,595,000; high blood pressure levels were responsible for 10.0% to 12.5% of the total DALYs (i.e., 159,500 to 199,375 DALYs).⁹

According to a recent global study that extracted data from 176 countries during the years 2000 to 2016, the estimated cost was 64,454 euro per DALY averted, in very high Human Development Index (HDI) countries (Greece included).¹⁰ Moreover, another recent systematic review and meta-analysis that included data from 15 countries, including Greece, reported that the average total costs of hypertension per person was estimated 838.52 euro for direct costs and 152.46 euro for indirect costs, which was

comparable to the costs estimated by Athanasakis et al., few years earlier.⁷

Thus, synthesising all the above, the total healthcare cost due to hypertension in Greece could be estimated to be more than 7.0 billion euros per year, which accounts for 2.7% of the Gross Domestic Product of Greece (for 2022).

Out-Of-Office Measurements for Hypertension Management

Indeed, the high prevalence of hypertension in Greece, and the considerable proportion of hypertensive individuals who are unaware of their status or are aware but uncontrolled, emerge the need for effective interventions that should be made. Related health economic analyses suggests that significant benefits, in terms of public health and fiscal costs, could be derived even from a small reduction on the prevalence of hypertension.

The latest guidelines (2021) from the Working Group on Blood Pressure Monitoring of the European Society of Hypertension suggest confirmation of office blood pressure measurements with out-of-office measurements, either home (HBPM), or ambulatory (ABPM), for the diagnosis and management of hypertension.¹¹ In line with that, the 2021 United States Preventive Services Task Force reports on screening for hypertension, has recommended ABPM as the reference standard for out-of-office BP levels monitoring.¹² Out-of-office methods allow a variety of measurements of blood pressure during daily life activities, and sleep time, eliminating white-coat effect, and better assessing masked, and nocturnal hypertension; they have also shown better efficiency in identifying individuals who might suffer from a future CVD event.¹³

It has been found that a widespread application of ABPM could be an effective mean of achieving better high blood pressure control at population level. Specifically, a study conducted in US suggested that use of ABPM may substantially reduce the cost of management for hypertension by 12%-14% within a five-year period.¹⁴ Recently, Shah et al.,¹⁵ to estimate blood pressure monitoring costs in Australia, performed a systematic search in the literature for economic studies evaluating the cost-utility of office, home, and ABPM. Over a lifetime model, ABPM had lower total costs compared with home monitoring, that was in line with the previous cost-effective analyses. Moreover, ABPM showed superior effectiveness compared with home blood pressure monitoring in terms of quality adjusted life years and life years gained.

If the previously reported results about the reduction of the cost of hypertension management by the wide use of ABPM would apply to the Greek population, the total fiscal gain could be up to 700 million euro per year, assuming 40%

hypertension prevalence and 35% of people with hypertension being uncontrolled. The cost of this preventive action per year is estimated not to exceed 100 million euros to adequately cover all hypertensive patients in Greece (i.e., for every one euro spent, up to 7 euros are gained in healthcare costs due to hypertension). However, the generalization of the results to other economies and health care systems should be done with cautiousness, as the total annual ambulatory measurement costs may significantly vary.

CONCLUSION

In conclusion, hypertension is a major public health problem in Greece, that has a significant fiscal burden.

Regular blood pressure monitoring, using ABPM, improves blood pressure control, and could significantly reduce DALYs and improve quality of life. At this point, however, it should also be underlined that compliance to medication and adherence to a healthy dietary pattern, with a restriction in sodium intake, should be the main target for the patient with hypertension.

Conflict of Interest

None to declare.

Funding

None to declare.

ΠΕΡΙΛΗΨΗ

Μη θεραπευόμενη, μη διαγνωσμένη αρτηριακή υπέρταση, in Greece; ένα φαινόμενο που επηρεάζει σημαντικά τη δημόσια υγεία

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Η υπέρταση στην Ελλάδα επηρεάζει ένα σημαντικό ποσοστό (περίπου 40%) του ενήλικου πληθυσμού. Επιπλέον, οι μη ενημερωμένοι, οι μη θεραπευόμενοι και οι θεραπευόμενοι αλλά μη ελεγχόμενοι ασθενείς με υπέρταση αποτελούν ένα σημαντικό σύνολο με σοβαρή επιβάρυνση για τη δημόσια υγεία. Σε αυτό το άρθρο έχουμε σκοπό να αποτυπώσουμε την εικόνα της δημοσιονομικής επιβάρυνσης της υπέρτασης στην Ελλάδα, συμπεριλαμβανομένου του κόστους με βάση τα Προσαρμοσμένα στην Αναπηρία Χρόνια Ζωής (DALY) που χάθηκαν και να συζητήσουμε τα πιθανά οφέλη για τη δημόσια υγεία που θα μπορούσαν να αποκομιστούν από βελτιώσεις στη διαχείριση της υπέρτασης σύμφωνα με τις πρόσφατες οδηγίες.

ΛΕΞΕΙΣ ΚΛΕΙΔΙΑ: Υπέρταση, υψηλή αρτηριακή πίεση, εκτός γραφείου μέτρηση αρτηριακής πίεσης

REFERENCES

1. GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020 Oct;396(10258):1223-49.
2. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: A pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet*. 2021 Sep;398(10304):957-80.
3. Antza C, Vazakidis P, Doundoulakis I, Bouras E, Haidich AB, Stabouli S, et al. Masked and white coat hypertension, the double trouble of large arteries: A systematic review and meta-analysis. *J Clin Hypertens (Greenwich)*. 2020 May;22(5):802-11.
4. Stergiou GS, Menti A, Kalpourtzis N, Gavana M, Vantarakis A, Chlouverakis G, et al. Prevalence, awareness, treatment and control of hypertension in Greece: EMENO national epidemiological study. *J Hypertens*. 2021 May;39(5):1034-9.
5. Panagiotakos DB, Pitsavos CH, Chrysohoou C, Skoumas J, Papadimitriou L, Stefanadis C, et al. Status and management of hypertension in Greece: Role of the adoption of a Mediterranean diet: the Attica study. *J Hypertens*. 2003 Aug;21(8):1483-9.
6. Damigou E, Kouvari M, Chrysohoou C, Barkas F, Kravvariti E, Pitsavos C, et al. Lifestyle trajectories are associated with incidence of cardiovascular disease: Highlights from the ATTICA Epidemiological Cohort Study (2002-2022). *Life (Basel)*. 2023 May;13(5):1142.
7. Athanasakis K, Souliotis K, Tountas Y, Yfantopoulos J, Kyriopoulos J, Hatzakis A. A short-term cost-effectiveness analysis of hypertension treatment in Greece. *Hellenic J Cardiol*. 2014 May-Jun;55(3):197-203.
8. Athanasakis K, Kyriopoulos II, Boubouchairpoulou N, Stergiou GS, Kyriopoulos J. Quantifying the economic benefits of prevention in a healthcare setting with severe

- financial constraints: The case of hypertension control. *Clin Exp Hypertens*. 2015;37(5):375-80.
9. GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020 Oct;396(10258):1223-49.
 10. Wierzejska E, Giernaś B, Lipiak A, Karasiewicz M, Cofta M, Staszewski R. A global perspective on the costs of hypertension: a systematic review. *Arch Med Sci*. 2020 Jan;16(5):1078-91.
 11. Stergiou GS, Palatini P, Parati G, O'Brien E, Januszewicz A, Lurbe E, et al. European Society of Hypertension Council and the European Society of Hypertension Working Group on Blood Pressure Monitoring and Cardiovascular Variability. 2021 European Society of Hypertension practice guidelines for office and out-of-office blood pressure measurement. *J Hypertens*. 2021 Jul;39(7):1293-302.
 12. US Preventive Services Task Force; Krist AH, Davidson KW, Mangione CM, Cabana M, Caughey AB, et al. Screening for Hypertension in Adults: US Preventive Services Task Force Reaffirmation Recommendation Statement. *JAMA*. 2021 Apr;325(16):1650-6.
 13. Shimbo D, Abdalla M, Falzon L, Townsend RR, Muntner P. Studies comparing ambulatory blood pressure and home blood pressure on cardiovascular disease and mortality outcomes: a systematic review. *J Am Soc Hypertens*. 2016 Mar;10(3):224-34.e17.
 14. Krakoff LR. Cost-effectiveness of ambulatory blood pressure: A reanalysis. *Hypertension*. 2006 Jan;47(1):29-34.
 15. Shah KK, Willson M, Agresta B, Morton RL. Cost Effectiveness of Ambulatory Blood Pressure Monitoring Compared with Home or Clinic Blood Pressure Monitoring for Diagnosing Hypertension in Australia. *Pharmacoecon Open*. 2023 Jan;7(1):49-62.