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Hypertension in the Polish elderly: Insights into prevalence, awareness, treatment, and control from the NOMED-AF study

Short title: Hypertension in Polish elderly: NOMED-AF study results

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WHAT'S NEW?

Our research provides insight into the hypertension landscape among Poland's elderly, emphasizing a growing prevalence, especially in individuals over 80 years old, which surpasses prior estimates. Notably, while awareness and treatment of hypertension are commendably high, optimal control of the condition remains unsatisfactory for a significant portion of the treated population. This challenge is particularly pronounced among elderly women, who,

despite being the most treated demographic for hypertension, show suboptimal control rates. Our findings suggest a pressing need for targeted interventions to enhance hypertension management in this vulnerable group, potentially involving more effective treatment strategies, patient education, and adherence support. These insights not only contribute to a deeper understanding of hypertension's impact on the elderly in Central and Eastern Europe but also underline the importance of tailored approaches in managing chronic conditions within aging societies.

ABSTRACT

Background: Hypertension is a significant global health issue, disproportionately affecting the elderly population. In Poland, the rapid aging of the population underscores the need for updated data on the epidemiology of hypertension among the elderly.

Aims: This study aimed to investigate the prevalence, awareness, treatment and control of hypertension among individuals aged 65 and older in Poland.

Methods: The NOMED-AF study, a cross-sectional survey conducted from March 2017 to March 2018, enrolled a representative sample of 3014 participants aged 65 and above using a multistage, stratified, and clustered sampling method. Data collection included standardized questionnaires and physical measurements carried out by trained nurses. Hypertension was diagnosed per the 2018 European Society of Hypertension/European Society of Cardiology Guidelines.

Results: The study revealed a hypertension prevalence of 82.5% in females and 78.3% in males aged 65 and older. Awareness of hypertension was high across all age and sex groups, with 86.2% of women and 83.4% of men being aware of their condition. Treatment rates were 84.8% in women and 80.5% in men. Optimal control of blood pressure among those treated was achieved in 40.3% of women and 45.6% of men. Women over 80 years old achieved optimal blood pressure control less frequently than males.

Conclusions: The results highlight the high prevalence and suboptimal control of hypertension among Poland's elderly, pointing to a significant public health challenge. Despite high levels of treatment, effective management of hypertension remains inadequate, emphasizing the need for enhanced strategies in hypertension care, particularly for elderly women.

Key words: blood pressure control, elderly, epidemiology, hypertension, Poland

INTRODUCTION

Hypertension, or high blood pressure (BP), is a prevalent health issue that affects nearly a third of the adult population worldwide [1]. In 2017, it was responsible for 10.4 million deaths and 218 million disability-adjusted life-years globally [2]. The prevalence of hypertension increases with age, affecting over 60% of individuals aged 60 years and older [3]. Poor control of BP can lead to a multitude of health issues, including stroke, heart attack, heart failure, valvular heart disease, peripheral artery disease and aortic syndromes, kidney disease and cognitive decline [4–12].

In Poland, it is crucial to understand the prevalence, awareness, and control of hypertension, especially among the elderly population, due to the rapid aging of the population. However, comprehensive and current knowledge on the epidemiology of hypertension in the Polish elderly population remains limited.

Our study aimed to address this gap by investigating the prevalence, awareness, and management of hypertension among the elderly in Poland between 2017 and 2018.

METHODS

The NOMED-AF study spanned from March 2017 to March 2018, and was approved by the Local Bioethical Committee of the Silesian Medical Board (26/2015) in adherence to the Declaration of Helsinki. The study was registered on ClinicalTrials.gov (NCT03243474), and its design details were previously published [13]. Respondents provided written informed consent to participate in the study.

Participant selection involved a multi-stage, stratified, and clustered sampling approach. The study sample consisted of 3014 randomly chosen individuals, and a weighted oversampling of older age groups was employed to ensure accurate estimates. All presented data was weighted to reflect the demographic age and gender structure of Poland in 2017. The exact sampling procedure has been described previously [14].

During each of the three visits (on day 1, day 10 and day 30 of the study, respectively), BP readings were obtained three times using a validated A&D UA 787 Plus fully automatic oscillometric BP monitor. The readings were taken from the participant's right upper arm while seated, and at intervals of 2 minutes after a resting period of at least 5 minutes. The average heart rate and BP values were recorded with an accuracy of 1 bpm and mm Hg, respectively. To assess average BP, the first and second measurements from the first and third visit were used. Hypertension was diagnosed according to the 2018 European Society of Hypertension/European Society of Cardiology Guidelines [15] and the 2023 European Society

of Hypertension Guidelines [16], requiring an average BP to be equal to or higher than 140 mm Hg (systolic blood pressure [SBP]) and/or 90 mm Hg (diastolic blood pressure [DBP]) during two separate visits. Patients taking hypotensive drugs over the past 2 weeks also met the criteria. Controlled hypertension was defined as a mean SBP of less than 140 mm Hg and a DBP of less than 90 mm Hg among those with arterial hypertension (AH).

In addition to the physical measurements, laboratory tests and a questionnaire survey were taken to gather information on the participants' awareness of AH and comorbidities. To evaluate hypertension awareness, participant's response to the following question has been recorded: "Has a doctor ever diagnosed you with hypertension?". Diabetes mellitus was diagnosed based on medical records or a glycated hemoglobin level greater than 6.5%, or confirmation of the diagnosis by the patient who reported taking antidiabetic medications in the past 2 weeks. Hypercholesterolemia was identified based on a total cholesterol level of at least 190 mg/dl and/or use of lipid-lowering therapy in the past 2 weeks. Heart failure diagnosis was confirmed through medical records or patient's confirmation of the diagnosis. The history of cardiovascular disease and interventions such as percutaneous coronary intervention or coronary artery bypass grafting was established based on the patient's medical records or their declaration. The diagnosis of ischemic stroke relied on medical records. Chronic kidney disease was identified based on medical records or a glomerular filtration rate less than 60 ml/min/1.73 m², or a glomerular filtration rate greater than 60 ml/min/1.73 m² accompanied by a urine albumin-to-creatinine ratio of 30 mg/g or more. To assess the thromboembolic risk, CHA₂DS₂-VASc Score was calculated for each participant based on the data provided by respondents as described above.

Statistical analysis

Continuous variables were presented as mean and standard deviation, and for non-normally distributed data, medians along with interquartile range, the first (Q1) and third (Q3) quartiles were reported. Categorical data was expressed in numbers and percentages. The χ^2 test was used for analysis of categorical data. The normality of distribution for continuous variables was confirmed using the Kolmogorov–Smirnov test. To compare the mean of normally distributed variables, Student's t-test was employed. For non-normally distributed variables, the Mann–Whitney U test was used. The results for the entire population of elderly Polish adults and for two main age groups (65–79 years old and 80 years and older) were weighted to account for respondents' age, sex, and place of residence. This was done to reflect the population structure of Poland in 2017. In-depth data on hypertension prevalence, treatment, and control were

analyzed in five-year age groups, separately for women and men; these age-group results were not weighted. The 95% confidence intervals (CI) were reported. A *P*-value of less than 0.05 was deemed statistically significant.

RESULTS

The study group had a weighted average age of 74.6 years and a crude average of 77.5 years. Participants were divided into 6 age brackets: 65–69, 70–74, 75–79, 80–84, 85–89, and 90 or older. The number of women and men in each age group were respectively 281, 325, 268, 273, 195, 135 and 291, 307, 317, 255, 247, 118. Hypertensive participants were significantly more often burdened with atrial fibrillation, increased body mass index, diabetes, heart failure and cardiovascular diseases, chronic kidney disease, and smoking in comparison to normotensive individuals (Table 1). Rates of hypertension prevalence, awareness, treatment and control according to sex and age are provided in Table 2. Supplementary data provides detailed results in 5-year subgroups (Supplementary material, Tables S1 and S2).

For all participants aged 65 or older, the mean BP was: 142.5 mm Hg SBP in women (95% CI, 141.6–143.5 mm Hg) and 141.1 mm Hg SBP in men (95% CI, 140.2–142.1 mm Hg); 79.3 mm Hg DBP in women (95% CI, 78.7–79.8 mm Hg) and 77.6 mm Hg DBP in men (95% CI, 77.0–78.1 mm Hg). The mean SBP did not differ significantly between sexes for participants under 80 years old but was higher in women than in men for those aged 80 and older. DBP decreased with age and was significantly lower in males than in females.

Hypertension prevalence was 82.5% in females (95% CI, 80.6%–84.5%) and 78.3% in males (95% CI, 76.0%–80.4%). The prevalence increased significantly in women aged 80 years and older in comparison to those aged 65–79 years old (90.5% and 79.1%, respectively; *P* <0.001), while it remained relatively stable in men regardless of their age. Hypertension awareness was high across all age and sex groups, with 86.2% (95% CI, 84.1%–88.0%) of women and 83.4% (95% CI, 81.1%–85.4%) of men being aware of their condition. Treatment rates for hypertension were also high, with 84.8% of women (95% CI, 82.7%–86.8%) and 80.5% of men (95% CI, 78.2%–82.6%) receiving treatment. Proper control of AH (BP <140/90 mm Hg) was observed in 37.9% of women (95% CI, 35.3%–40.7%) and in 40.8% of men (95% CI, 37.8%–43.9%). Among those treated, 40.3% of women (95% CI, 37.4%–43.4%) and 45.6% of men (95% CI, 42.4%–48.9%) had well-controlled hypertension. Women over 80 years old achieved optimal blood control significantly less often than men.

DISCUSSION

The prevalence of hypertension in the elderly population of Poland is significant, as highlighted by our findings. According to data from Polsenior survey conducted between 2007 and 2011, the estimated prevalence of hypertension in the adult Polish population aged 65 years or more was 70.1% in men and 78.2% in women [17]. Our study indicates an increase in hypertension prevalence among the elderly in Poland, with a shift towards people over 80 years of age compared to septuagenarians in the Polsenior study. Although unsatisfactory, a noticeable increase in BP control among treated individuals is also noteworthy (31%–38% in Polsenior study and 40%–45% in NOMED-AF).

Treating hypertension in older adults, especially those over 80 years old, is a complex issue that requires careful consideration of the potential benefits and risks of treatment. Research shows that lowering BP in older adults may reduce not only the rate of cardiovascular events, but also all-cause mortality [18]. Our results suggest that this is particularly important for elderly women in Poland. This group has the highest prevalence of hypertension and is the group most frequently receiving treatment for hypertension. However, only one in three of them achieve proper control rates. Similar findings have been described in most recent NHANES study results, where a decline in BP control has been noted in American women and adults over 75 years old between the years of 2009–2012 and 2017–2018 [19]. The reason for such phenomenon is not clear. A cohort study analyzing prescription data has found that 22.9% of women had poor adherence to hypertension treatment with contributing factors including multimorbidity, the use of fewer classes of antihypertensive medications, and depressive symptoms [20]. This insufficient BP control in women could lead to further gender-associated health disparities. The link between elevated BP and the likelihood of a stroke or heart failure is more pronounced in women than in men, as observed in both the Original Framingham Heart Study and the Framingham Offspring Study [21–23]. Intensive efforts are therefore necessary to improve hypertension control, especially among older women.

Our study is one of the few large, population-based and cross-sectional studies in Central and Eastern Europe on the epidemiology of hypertension among older people, including those over 80 years of age. Data from Central and Eastern Europe is scarce and mainly focuses on the 65–79 age group. The SEPHAR III study (2016) [24] reported a hypertension prevalence rate of 75.1% and a control rate of 17.8% in respondents aged 65–79 in Romania. The Hungarian ABPM Hungary Registry (2021–ongoing) [25] recently published data on hypertension epidemiology in adults aged 18–100 years, suggesting a hypertension prevalence of 69% and a control rate of approximately 32% in general population. Conversely, the DEGS1 study (2008–2011) reported a hypertension prevalence of 71% among 65–79 year olds in

Germany, with proper hypertension control achieved in 71.0% of treated men and 67.8% of treated women [26]. The more recent KORA-Age 1 study reported a prevalence of hypertension to be 73.8% and a proper BP control rate of 53.7% in Germans aged 65 to 94 years [27]. According to a 2023 meta-analysis of 112 cohort studies [28], high SBP is the leading risk factor for cardiovascular disease and death worldwide, with the greatest impact observed in Central and Eastern Europe. The disparity in achieving optimal BP control between Eastern and Western Europe is concerning, especially considering that hypertension can double or triple the risk of stroke in patients with concurrent atrial fibrillation, a condition that affects 19.2% of the population aged 65 years or older according to the findings of the NOMED-AF study [14].

The strengths of our study include the use of a large, nationally representative dataset and accurate clinical measurements taken by trained nurses. BP was meticulously measured using optimal techniques, including the selection of the correct cuff size based on arm circumference. Additionally, a weighted analysis compensated for the clustered sampling approach, enhancing the accuracy of the hypertension prevalence estimates. Despite our study's comprehensive nature, several limitations must be acknowledged. The overall response rate was 44%, which may be partly due to the NOMED-AF study's intricate and lengthy processes involving questionnaires and physical assessments across 3 home visits. Additionally, focusing on a geriatric demographic resulted in a significant number of participants opting out. Therefore, while we have attempted to ensure representativeness, our findings may not fully capture the nuances of hypertension prevalence and control among the entire elderly population due to potential selection bias in participant recruitment.

In conclusion, our study underscores the high prevalence and suboptimal control of hypertension in the elderly population of Poland. Despite notable levels of awareness and treatment, the effectiveness of hypertension management remains inadequate. This highlights the need for improved prevention and treatment approaches, such as adopting single-pill combination therapies, dose intensification without unnecessary delay, and improved patient education for more effective hypertension management.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

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Table 1. Study participants' characteristics

Characteristics and comorbidities of the study population					
		All	Hypertensives (HT)	Normotensives (NT)	<i>P</i> -value
Females	% (95% CI)	60.6 (59–62.3)	61.9 (60.0–63.7)	55.3 (51.2–59.3)	0.003
Age	Mean (95% CI)	74.6 (74.4–74.9)	75.0 (74.7–75.3)	73.1 (72.5–73.7)	<0.001
Arterial hypertension	% (95% CI)	80.9 (79.4–82.2)	100%	–	
Atrial fibrillation	% (95% CI)	19.2 (17.9–20.5)	20.6 (19.2–22.2)	12.9 (10.5–15.8)	<0.001
BMI, kg/m ²	Mean (95% CI)	28.3 (28.1–28.5)	28.8 (28.6–29)	26.4 (26–26.7)	<0.001
Diabetes	% (95% CI)	28.2 (26.7–29.9)	32.6 (30.7–34.6)	9.8 (7.9–12.1)	<0.001
Hypercholesterolemia	% (95% CI)	79.7 (78.3–81.1)	79.7 (78.1–81.2)	79.8 (76.6–82.6)	0.96
Smoking	% (95% CI)	14.1 (12.8–15.5)	11.9 (10.5–13.3)	23.6 (20.0–27.7)	<0.001
Heart failure	% (95% CI)	17.5 (16.2–18.9)	19.5 (18.0–21.2)	9.0 (7.2–11.1)	<0.001
Chronic coronary syndrome or acute	% (95% CI)	41.5 (39.7–43.3)	45.2 (43.1–47.4)	25.7 (22.4–29.3)	<0.001

coronary syndrome or PTCA or CABG or PAD or stroke					
Chronic kidney disease	% (95% CI)	27.6 (26.1– 29.1)	29.8 (28.0–31.6)	18.4 (15.8–21.2)	<0.001
Ischemic stroke	% (95% CI)	6.2 (5.5– 7.1)	6.6 (5.8–7.6)	4.5 (3.0–6.7)	0.12
CHA ₂ DS ₂ -VASc Score	Median (IQR)	4.0 (2.0)	4.0 (2.0)	2.0 (1.0)	0.20

Abbreviations: BMI, body mass index; CABG, coronary artery bypass graft; CI, confidence interval; IQR, interquartile range; PAD, peripheral artery disease; PTCA, percutaneous transluminal coronary angioplasty

Table 2. Mean systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse rate, and pulse pressure. Prevalence, awareness, treatment, and control of hypertension

Blood pressures and heart rate in the NOMED-AF study participants			
	Women	Men	<i>P</i> -value
SBP, mm Hg			
65–79 years	141.1 (140.0–142.3)	141.7 (140.5–142.8)	0.47
≥80 years	145.8 (144.2–147.4)	139.4 (137.9–140.9)	<0.001
DBP, mm Hg			
65–79 years	80.3 (79.7–81.0)	78.8 (78.2–79.5)	<0.001
≥80 years	76.9 (76.1–77.8)	72.9 (72.2–73.7)	<0.001
Pulse rate, bpm			
65–79 years	71.2 (70.5–71.9)	70.5 (69.9–71.1)	0.06
≥80 years	70.7 (69.9–71.5)	68.6 (67.9–69.2)	0.002
Pulse pressure, mm Hg			
65–79 years	60.8 (59.8–61.8)	62.8 (62.0–63.7)	0.002
≥80 years	68.9 (67.5–70.3)	66.5 (65.3–67.7)	0.08
Hypertension prevalence in the NOMED-AF study participants			

	Women		Men		
Prevalence	%	95% CI	%	95% CI	
65–79 years	79.1	76.5–81.4	78.1	75.3–80.6	0.59
≥80 years	90.5	88.2–92.4	79.0	75.6–82.0	<0.001
Awareness, treatment, and control of hypertension (blood pressure <140/90 mm Hg) in the NOMED-AF study participants					
	Women		Men		<i>P-value</i>
Awareness	%	95% CI	%	95% CI	
65–79 years	85.7	82.9–88.1	83.6	80.9–86.0	0.26
≥80 years	87.2	84.2–89.6	82.4	79.0–85.3	0.02
Treatment	%	95% CI	%	95% CI	
65–79 years	84.0	81.0–86.5	80.5	77.7–83.0	0.08
≥80 years	86.6	83.6–89.1	80.6	77.1–83.7	0.006
Control (all participants with hypertension)	%	95% CI	%	95% CI	
65–79 years	39.4	35.9–43.0	39.9	36.2–43.6	0.86
≥80 years	35.1	31.0–39.3	44.4	40.7–48.2	0.001
Control (all treated hypertensives)	%	95% CI	%	95% CI	
65–79 years	42.6	38.8–46.4	45.1	41.0–49.2	0.35
≥80 years	35.9	31.5–40.6	47.3	43.4–51.4	<0.001

Abbreviations: bpm, beats per minute; CI, confidence interval