

# Prevalence of hypertension in a sample of Polish population – baseline assessment from the prospective cohort ‘PONS’ study

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## Abstract

**Objective:** The aim of this cohort study was to evaluate the prevalence of hypertension and cardiovascular risk factors in the studied population.

**Methods:** Presented results are a part of the Polish-Norwegian Study (PONS) project. The study group consisted of 3,862 inhabitants of Świętokrzyskie Province aged 45-64 years (2,572 females and 1,290 males).

**Results:** Prevalence, awareness and control of hypertension was evaluated in the studied population of 3,854 urban and rural inhabitants. Mean blood pressure in the whole studied population was 139.6/81.9 mmHg; of the studied population 61.7% were hypertensive. Hypertension was more prevalent in the studied males (70.63%) than in the females (57.24%). In both males and females, the older subgroups (55-64 y.o.) had significantly higher blood pressure than the younger subgroups (45-54). Education had a significant impact on the prevalence of hypertension, and the highest prevalence of hypertension was observed in the middle level educated groups of females and males. No significant difference was observed between rural and urban inhabitants. In both females and males, the prevalence of hypertension significantly decreased with level of education. Hypertension was well-controlled in only 13.8% of the subjects. More studied females than males achieved good control of blood pressure (14.09 vs. 12.7%), and better control of blood pressure was significantly more frequent in better those who were better educated. Hypertension was not diagnosed in 23.2% of studied population. Significantly, more males than females had undiagnosed hypertension (30.4 vs. 19.5%). No significant difference between rural and urban populations was observed. Interestingly, both in females and males, the better educated groups had more undiagnosed hypertension than those who were well-educated.

**Conclusions:** The studied group had a high prevalence of hypertension (61.7%), which was less frequent and better controlled in the studied females than in the males. No significant difference was observed between the urban and rural populations. Level of education had significant impact on the prevalence of hypertension.

## Keywords

prospective study, cohort study, hypertension

## INTRODUCTION

Hypertension is the most common chronic cardiovascular disease in adults, and its prevalence varies between high and low income countries [1,2]. According to the WHO, hypertension is the leading cause of death worldwide [3, 4]. The risk associated with hypertension has been determined in large national and global epidemiological surveys, confirming

a strong association with cardiovascular morbidity and mortality [4]. Therefore, a high prevalence of hypertension results in high health care system costs since it contributes to the increase of cardiovascular morbidity.

Known hypertension risk factors include: age, gender, obesity, lifestyle (diet, physical activity) and stress, among others [5,6]. Hypertensive individuals frequently have additional cardiovascular risk factors, e.g. obesity, diabetes, dyslipidemia, insulin resistance [7,8]. Hypertension tends to cluster in people from the lower social classes, with lower income and education [9]. Although numerous risk factors have been identified, a complete understanding of the causes of hypertension and its high prevalence remains unclear.

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The European Society of Hypertension (ESH) and European Society of Cardiology (ESC) Guidelines define that hypertension is controlled when systolic blood pressure is <140 mm Hg and diastolic <90 mmHg [10]. Treatment of hypertension has been shown to prevent cardiovascular morbidity and mortality [11]; however, in most countries the majority of patients still have inadequately controlled blood pressure [12].

Cardiovascular diseases are the leading cause of death in Poland, and Polish epidemiologic data indicate that hypertension prevalence ranges from 29-44% [13-15]. The most recent data from the NATPOL 2011 survey indicates, however, that hypertension affects 32% of the Polish population, and blood pressure is well-controlled only in about 26% of all hypertensive patients [16]. Therefore, it is necessary to identify the risk factors for hypertension, as well as other factors affecting the prevalence of hypertension and treatment effectiveness in Poland.

The presented cohort study was undertaken in order to assess the magnitude of the problem of hypertension in Poland. The aim of this study was to evaluate hypertension prevalence, level of awareness, identification and control of cardiovascular risk factors in the population of Świętokrzyskie Province.

## MATERIALS AND METHODS

The presented results are a part of the PONS project – a prospective cohort study of inhabitants of Świętokrzyskie Province in Poland. The study group comprised 3,862 inhabitants of Świętokrzyskie Province aged 45-64 years (2,572 females and 1,290 males). There were 1,182 rural inhabitants (396 males and 786 females) and 2,680 urban inhabitants (894 males and 1,786 females). The study was conducted between 2010-2011.

Measurement of blood pressure were taken using a certified digital sphygmomanometer. The patients were advised to sit quietly and rest for 5 minutes before measurements. The appropriate cuff size was selected and a second reading was taken 5 minutes after the first, and a third reading 5 five minutes later. The average of the 3 measurements was used to diagnose hypertension according to the ESC criteria (systolic blood pressure 140 or above and/or diastolic blood pressure 90 mmHg or above). A respondent was also diagnosed as hypertensive if the diagnose of hypertension had been made previously by a health professional, or if the patient was undergoing antihypertensive treatment. Hypertension was considered controlled if the objectives in the ESH/ESC Guidelines were met (blood pressure <140/90 mmHg) [17]. Resting heart rate was measured after a 5 minute rest period.

Height and weight were recorded by a nurse using calibrated scales. Waist circumference was measured in centimeters using an inelastic tape placed between the lower ribs and iliac crest. A questionnaire on education and smoking status was also completed. The education of each participant was recorded in 4 categories: primary, vocational (trade), secondary and higher (university) education.

Statistical analysis were made using computer programme STATISTICA v 9.1 PL StatSoft Inc., USA.

**Ethics.** The study was approved by the Ethics Committee of the Cancer Centre and Institute of Oncology in Warsaw, Poland.

## RESULTS

3,854 urban and rural inhabitants were studied. Mean blood pressure in the whole studied population was 139.6/81.9 mmHg. Of studied population, 61.7% were hypertensive; 11.9 % had optimal blood pressure, 18.2% normal blood pressure and 21.4% high normal blood pressure. Hypertension was more prevalent in the studied males (70.63%) than in females (57.24%). Mean blood pressure in the studied males was 144.2/84.8mmHg, and 139.6/81.9 mmHg in females. Mean blood pressure was significantly higher among participants aged 55-64 than those aged 45-54 (142.2/82.2 vs 135.8/81.8 mmHg).

Education had a significant impact on prevalence of hypertension. In both females and males, the prevalence of hypertension significantly decreased with the level of education. In subjects with primary education, the prevalence of hypertension was 69.4%, in subjects with vocational education 66.8%, in subjects with secondary education 62.8%, and in university educated people 55.8%. A significant impact was found of increased WHR and BMI on hypertension prevalence, but smoking status had no significant impact on hypertension prevalence in the logistic regression analysis.

No significant difference was observed in hypertension prevalence between rural and urban inhabitants. Mean blood pressure was 138.8/82.2 mmHg in rural inhabitants and 139.9/81.8 mmHg in urban inhabitants. The prevalence of hypertension was similar in rural and urban inhabitants (61.1 and 61.9%, respectively).

**Table 1.** Categories of hypertension according to gender

Blood Pressure	Female	Male	All	P (Chi <sup>2</sup> )
optimal BP	15.04%	5.91%	11.99%	
normal BP	19.79%	15.70%	18.42%	
high normal BP	21.97%	20.44%	21.46%	
hypertension gr. 1	9.54%	14.22%	11.11%	
hypertension gr.2	6.04%	11.19%	7.76%	
hypertension gr.3	2.10%	4.20%	2.80%	
isolated systolic BP	25.52%	28.36%	26.47%	<0.0001

**Table 2.** Control of hypertension according to gender

Blood pressure	Female	Male	All	P (Chi <sup>2</sup> )
normal BP	42.76%	29.38%	38.30%	
not detected	19.55%	30.39%	23.16%	
controlled	14.09%	12.73%	13.64%	
out of control	23.61%	27.50%	24.90%	<0.0001

**Table 3.** Mean systolic and diastolic blood pressure according to gender and education

Education	Female	Male	All	P (ANOVA)
primary	140.3/81.0	148.3/83.6	142.3/81.0	
vocational	137.8/81.2	137.8/83.6	140.3/82.3	
secondary	138.2/80.8	145.1/85.1	140.1/82.1	
higher	134.9/79.8	143.3/85.1	137.9/81.6	<0.0001

Hypertension was well controlled in only 13.6% of subjects. More studied females than males achieved good control of blood pressure (14.09 vs 12.7%), and adequate control of blood pressure was significantly more frequent in educated people. Hypertension was better controlled in females, regardless of age. Patients with uncontrolled hypertension were younger, more frequently males, and overweight.

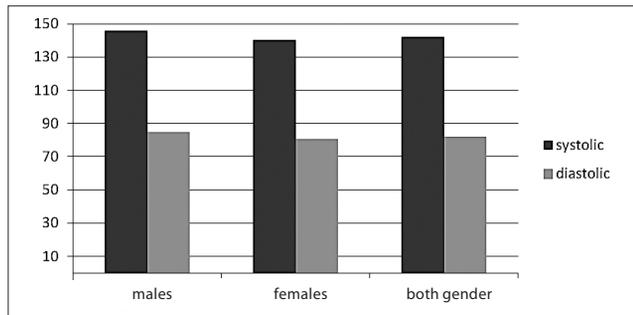


Figure 1. Mean systolic and diastolic arterial blood pressure according to gender [p(Chi<sup>2</sup>) for systolic and for diastolic blood pressure < 0.0001]

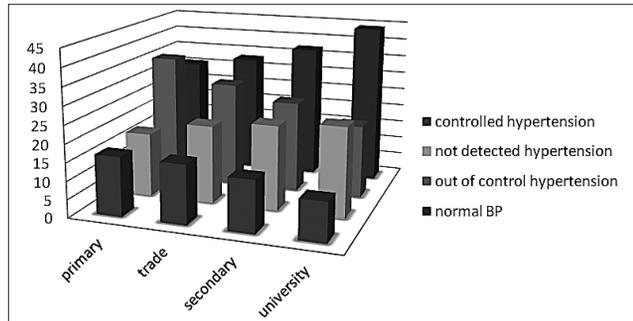


Figure 2. Control of hypertension according to education [p (Chi<sup>2</sup>) < 0.0001]

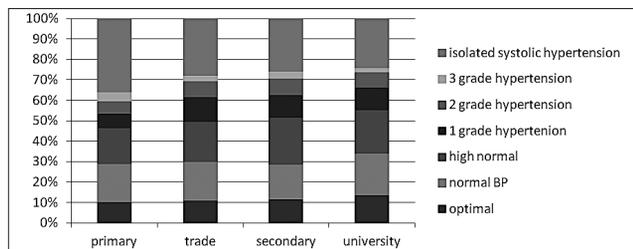


Figure 3. Categories of hypertension according to level of education [p(ANOVA) = 0.007]

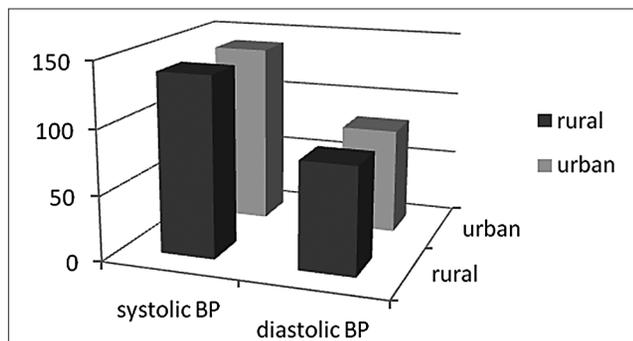


Figure 4. Mean systolic and diastolic arterial blood pressure in urban and rural inhabitants [p(ANOVA)=0.10 for systolic and p(ANOVA)=0.35 for diastolic blood pressure]

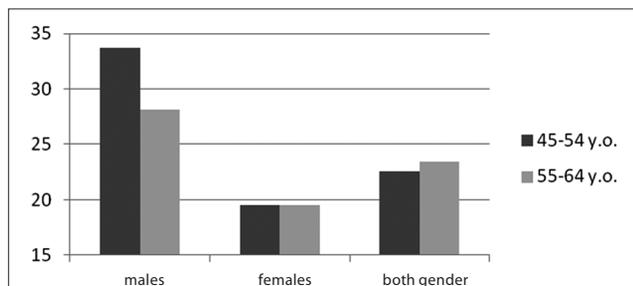


Figure 5. Not detected hypertension according to gender in the 45-54 age group and 55-64 age group [p(Chi<sup>2</sup>) for age 45-54 and for age 55-64 < 0.0001]

23.1% of studied population was not aware of their hypertension. Significantly more males than females had undiagnosed hypertension (30.4 vs 19.5%). Undiagnosed hypertension was more prevalent among participants aged 45-54 than those aged 55-64 (33.7 vs 28.1%). Undiagnosed hypertension was as common between females aged 45-54 than in females aged 55-64.

Interestingly, both in females and males, better educated groups had a higher proportion of undiagnosed hypertension than those who were less well educated. Undiagnosed hypertension was found in 17.7 % of people with primary education, 21.55 % of people with vocational education, 23.3 % with secondary education, and 24.7 % of those with university education. As many as 33.7 % of hypertensive males and 20.1 % of hypertensive females with university education had undiagnosed hypertension. No significant difference were found between rural and urban inhabitants according to undiagnosed hypertension.

Mean heart rate in all studied groups was 72.1, and no significant differences were observed between males and females. The heart rate level was significantly higher among participants aged 55-64 than those aged 45-54. Education and area of residence had no impact on heart rate level.

## DISCUSSION

Hypertension is a major cardiovascular factor and its prevalence differs in relation to age, gender, and education [18]. Urbanization may also be considered as a risk factor of hypertension and cardiovascular diseases [19]. The current project revealed a hypertension prevalence of 67% in the studied population. The prevalence of hypertension in the PONS population was higher than described previously for Poland (NATPOL plus study-45% in the group aged 45-64; Pol-Monica-study – 34%, WOBASZ study – 36%) [13-15]. Recently, at the 15<sup>th</sup> International Congress of the Polish Cardiac Society the results of the epidemiological study NATPOL 2011 were presented. The prevalence of hypertension in Poland increased compared to 2002 (32 vs 30%) [16]. The reported prevalence of hypertension in Poland between 1987 and 1989 was very high and amounted to 70.7% [20].

Blood pressure in males and females among participants aged 55-64 was higher than those aged 45-54. These data confirm other epidemiologic studies which indicate a higher prevalence of hypertension among males compared to females, and age as a risk factor for hypertension.

The prevalence of undetected hypertension in the PONS population was 23.1%. The results of NATPOL 2011 study showed a higher prevalence (30%) of undiagnosed hypertension in Poland [16], and was observed more frequently in males than in females and in the younger group of males. This result shows that females are more interested in knowing their blood pressure and more eager to measure their blood pressure, and indicates the need to implement action for detecting hypertension in males. A similar prevalence of undetected hypertension in urban and rural inhabitants could indicate an equal access to health service and/or similar problems with blood pressure control in males, regardless their place of residence .

Surprisingly, the highest prevalence of undiagnosed hypertension was observed in the group of well-educated

people; however, the prevalence of inadequately controlled hypertension was lower in that group than in less well educated people. The results point to the worse effectiveness of preventive measures in higher educated people, which indicates a lower frequency of routine blood pressure measurements in this group. Thus, it is necessary to improve the detection of hypertension in highly educated people.

The studied hypertensive subjects had adequately controlled blood pressure in only 13.6%. This result is significantly worse than that observed in the recent NATPOL 2011 study in which 26% of hypertensive patients were treated adequately [16]. This may reflect regional differences in access to health services and efficacy of preventive actions in Poland. The percentage of adequately controlled blood pressure in hypertensive subjects is much lower than reported from other countries. The United Kingdom reported a rate of controlled blood pressure of 52% [21] and the USA of 50.1% [22]; however, the NHANES 2005-2008 study revealed adequate hypertension control in 46% of hypertensive subjects in the USA [23].

Worse control of blood pressure was reported in older females in the NHANES survey [24,25]. In the presented study, the cohort of younger males were more likely to have uncontrolled hypertension, and hypertension control was related to age and level of education, and not related to area of residence (rural vs urban). Hypertension was inadequately controlled more frequently among younger males age 45-54, than among the older group aged 55-64. Similar findings have also been reported in the literature [26].

Low socio-economic status increases the risk of hypertension. A possible explanation of this fact includes association with a poor lifestyle, including more smoking, less healthy diet, less physical exercise, and therefore increased risk for obesity and metabolic syndrome [27]. In the presented study education was used as a marker of socio-economic status. No significant differences were observed in blood pressure between urban and rural inhabitants. An impact of WHR and BMI on hypertension prevalence was found: thus, weight status could intervene as a mediator in associations between education and blood pressure. The study shows the highest prevalence of hypertension in the middle level educated group. Further research is required to elucidate the high prevalence of hypertension in the middle level of educated people. To summarize, many individuals in Poland with hypertension remain unaware of their condition. Of those who are aware, too many are inadequately treated, despite the availability of large number of effective and well-tolerated antihypertensive drugs. In an effort to improve prevention, detection, treatment and control of hypertension, more educational activities are needed for the patients and health care professionals such as health education and screening services.

## CONCLUSIONS

The studied group had a high prevalence of hypertension (61.7%). Hypertension was less frequent and better controlled in the studied females than in males. Blood pressure control rates were not satisfactory in the studied population. No significant differences were observed between urban and rural inhabitants. The level of education had a significant impact on the prevalence of hypertension. Therefore, special attention should be given to the groups most affected, the

undiagnosed and inadequately treated to improve the knowledge, attitude and behaviors of both patients and health professionals.

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