

# Prevalence of hypertension and major cardiovascular risk factors in healthy residents of a rural region in south-eastern Poland – 1997–2008/9

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## Abstract

**Introduction and objective.** The aim of this study was to show the prevalence of hypertension and major risk factors of cardiovascular disease among healthy adults in an agricultural region of south-eastern Poland, and the changes which have occurred in this area during the 12-year follow-up.

**Materials and method.** 1,233, mostly rural inhabitants of Zamosc County without previous history of diabetes and CVD were subjected to analysis. Prevalence of hypertension and major cardiovascular risk factors were evaluated. Changes in the prevalence of risk factors between 1997 – 2008 were analyzed.

**Results.** 33.0% of the examined population are active smokers, and there was a 1.8-fold increase ( $p = 0.0009$ ). The percentage of people with hypercholesterolemia between 1997 – 2008/9 increased almost 2-fold ( $p < 0.0001$ ) and now it is 62.3%. The number of people with high blood pressure decreased nearly by a half (46%,  $p < 0.0001$ ) and it is currently 25.8%. Improper waist circumference was observed in 32.8% of the population (33.1% women, 26.5% men). Abdominal obesity decreased among men (48%;  $p = 0.0008$ ) and rural residents (29%,  $p = 0.01$ ). In comparison with 1997, in 2008–2009, the cardiovascular risk assessed using SCORE tables increased. The percentage of people with high-risk ( $\geq 5\%$ ) almost tripled in the general population ( $p = 0.0183$ ) and increased 4-fold in men ( $p = 0.0145$ ).

**Conclusions.** Detection of hypertension in the rural region in which the survey was carried out is still too low. Actions against tobacco addiction should be a major component of health-education programmes for the rural areas of south-eastern Poland.

## Key words

risk factors, cardiovascular diseases, rural population

## INTRODUCTION

Regardless of the achievements of modern cardiology, cardiovascular disease (CVD) prevention remains a basic tool for the reduction of morbidity and mortality. Although premature mortality due to CVD in Poland is decreasing systematically, particularly due to the observed lifestyle changes among Poles, it still remains one of the highest in Europe and continues to be the leading cause of death in the country. Therefore, it seems of great importance to increase the efforts to educate society in terms of health care and introduce more effective prevention programmes. In order to undertake rational actions, it is vital to have current knowledge on the occurrence of particular risk factors. In order to obtain this knowledge, epidemiological studies are carried out. Such large-scale studies have been conducted several times in Poland, with their crowning achievement being the NATPOL 2011 study (preliminary results published in 2011), which demonstrated the prevalence of major risk factors and their changes that occurred in Poland during the last decade [1]. The prevalence of both hypertension (HA) [2] and other CVD risk factors, including smoking [3], in various regions of Poland, mostly explained by varying degrees of urbanization, have already been documented.

The presented study with respect to the Lublin region is especially unique. According to the data derived from the WOBASZ study, a few years ago the frequency of occurrence of HA and the incidence of the metabolic syndrome in this region was the lowest in Poland. However, there is lack of large epidemiological studies focusing on the rural population. The aim of this study was to analyze the prevalence of HA and the main risk factors for cardiovascular diseases among healthy adults in a typical Polish agricultural region, and to attempt to assess the changes that have occurred in that area over the last 12 years.

Although the identified risk factors are counted in dozens, the classic ones, such as: hypertension, dislipidemia, abdominal obesity, diabetes, and smoking in combination with psychosocial factors, still cause over 90% of heart attacks [4] and almost the same number of strokes [5]. Possible early detection and effective elimination of at least the major modifiable risk factors still seem to be the most effective ways to reduce the epidemic of cardiovascular disease. Therefore, an attempt was made to assess risk factors and focus on the healthy population who were the main recipients of prevention programmes.

## MATERIALS AND METHOD

1,233, mostly rural inhabitants of Zamosc County, without previous history of diabetes and CVD, were subjected to

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the analysis. The primary source of the collected data was a number of surveys carried out on individuals and gathered from them by medical staff during outdoor events promoting healthy lifestyle organized by the Department of Cardiology of The Pope John Paul II Hospital in Zamosc in 1997 and 2008. An additional source of the surveys came from the programme of Cardiovascular Disease Prevention (PPChUK) collected in 2008 and 2009 by GP doctors in health centres, spanning the area of the county (outside the actual city of Zamosc). People diagnosed with HA, diabetes, and other CVD, people younger than 35 and older than 69 years were excluded in order to unify the inclusion criteria. The presence of the risk factors for cardiovascular disease, the results of measurements of blood pressure, serum total cholesterol (TC) and glucose (glucose was not evaluated in the 1997 studies), as well as survey data on physical activity, were analyzed. Systolic blood pressure (SBP) of 140 mm Hg, and diastolic blood pressure (DBP) of 90 mm Hg were considered abnormal.

In 1997, diagnosis was based on a single measurement. In 2008 and 2009, the average value of 3 measurements made during a single visit was calculated. Hyperglycaemia was defined as 126 mg/dL (7.0 mmol/L) for fasting glucose and 200 mg/dL (11.1 mmol/L) for casual glucose, hypercholesterolaemia as 190 mg/dL (5.0 mmol/l) for TC. Improper waist size was considered at 102 cm for men and 88 cm for women. In 1997, the respondents were only asked about the subjective evaluation of their physical activity. Due to the fact that all the respondents found it satisfactory, the results were not included in the further analysis. In the group of subjects in 2008/9, the recreational physical activity lasting at least 30 min. and exercising at least 4 times a week was considered satisfactory.

In most cases, the obtained data was sufficient to assess cardiovascular risk using the SCORE algorithm, in the version optimized for the Polish population [6]. The incidence of the occurrence of HA, and (in the available scope) of individual risk factors in 1997 and 2008/9 was assessed.

Statistical analysis of the data was performed using the programme Statistica, version 7.1. To assess the significance of the differences between the groups, respectively, to the type and the characteristics of the data, the Pearson chi-squared test and the Mann-Whitney test were applied. In all comparisons,  $p \leq 0.05$  was the statistically significant value.

## RESULTS

From the initial number of 870 questionnaires collected during outdoor medical events, after excluding those with any history of diabetes, hypertension, and cardiovascular disease, 479 were left. The study included 121 people surveyed in 1997 (44.5% of the collected questionnaires) and 358 tested in 2008 (59.9% of the collected questionnaires). PPChUK provided an additional 754 surveys for the years 2008 – 2009. Among 1,233 respondents interviewed, there were 738 women (59.9%) and 495 men (40.1%) (Tab. 1).

The risk factors for cardiovascular disease between 1997 – 2008/2009 were compared (Tab. 2, 3). The observed negative changes included the increase in the number of smokers and the number of people with hypercholesterolaemia. The percentage of people at high cardiovascular risk assessed by the SCORE tables also increased. The reduction in the

**Table 1.** Baseline characteristics of subjects (n=1233; 1997 – 121, 2008/9 – 1112)

		1997	2008/9
Gender	Female	80	658
	Male	41	454
Place of residence	Village	91	966
	city up to 70,000 inhabitants	30	146
<b>Total</b>		<b>46.2±7.3</b>	<b>45.5±7.5</b>
Mean age ± SD [years]	female gender	46.4±7.2	45.3±7.7
	male gender	45.9±7.6	45.9±7.2
	Rural	46.4±7.6	44.8±7.0
	Urban	45.8±6.5	50.2±9.0

SD – standard deviation

number of abdominal obesity among men, and the decrease of average values of blood pressure, particularly SBP, and the percentage of people with unrecognized HA, can be rated as positive changes.

There was a 1.8-fold increase in the number of active smokers ( $p = 0.0009$ ). 33.0% of the examined population were active smokers (22.1% of women and 48.7% men). This growth was mainly caused by 2.2-fold increase in the percentage of smokers among rural inhabitants ( $p=0.0002$ ). The number of smokers increased comparably among men (1.7-fold,  $p=0.0171$ ) and women (1.8-fold,  $p=0.0461$ ). However, the average number of cigarettes smoked daily did not change (17.4 vs. 15.9;  $p=0.465$ ). The percentage of people with hypercholesterolaemia between 1997 – 2008/9 increased almost 2-fold ( $p<0.0001$ ) to the level of 62.3% (women – 58.8%; men – 67.4%). This phenomenon was not observed among the urban population. The greatest increase has been noticed among women (2.1-fold;  $p<0001$ ) and rural residents (2-fold;  $p<0001$ ). The average concentration of TC among people with abnormal values (223 vs 229 mg/dl;  $p=0.1696$ ) did not change, although in the group of the rural population a slight increase was recorded (218 vs 228 mg/dl;  $p=0.0426$ ).

Improper waist circumference is observed in 32.8% of the population (33.1% women; 26.5% men). Abdominal obesity decreased among men (48%;  $p=0.0008$ ) and rural residents (29%;  $p=0.01$ ). The changes in the general population do not seem to indicate any significance ( $p=0.0515$ ). The number of obese people, taking into consideration body mass index (BMI), did not undergo any alternation ( $p=0.1684$ ). The average BMI also remained unchanged (26.9 vs. 26.5;  $p=0.289$ ).

The number of people with high blood pressure decreased by nearly a half (46%;  $p < 0001$ ) and currently totals 25.8% of the population of healthy individuals (20.8% women; 33% men). Although this decrease was also observed, it did not reach statistical significance only in the group of city dwellers as well as among women, when the study was restricted to assessing only the DBP. Average SPB values decreased (133.4 vs. 126.9 mm Hg;  $p<0.0001$ ), but not among the urban population. The average normal SBP (122.6 vs. 120.6 mm Hg;  $p=0.1367$ ) and abnormal SBP (148.8 vs. 150.7 mm Hg;  $p=0.323$ ) did not change. The average values of DBP in the general population remained unaltered (80.4 vs 79.7 mm Hg;  $p=0.1544$ ), although their decline among men was revealed (85.5 vs 82.0 mm Hg,  $p=0.0063$ ). The average values of normal DBP among the population did not change (75.6 vs 76.7 mm Hg;  $p=0.4771$ ). Nevertheless, there was a slight increase in

**Table 2.** Selected risk factors in a healthy population of rural areas in south-eastern Poland between 1997–2008/9

		1997		2008/9		difference		p*
		n	%	n	%	absolute (Δ %)	relative (%)	
Smoking	total	22/121	18.2	366/1108	33.0	+ 14.8	+ 81.3	0.0009
	females	10/80	12.5	145/655	22.1	+ 9.6	+ 76.8	0.0461
	males	12/41	29.3	221/453	48.7	+ 19.4	+ 66.2	0.0171
	rural	14/91	15.4	332/962	34.5	+ 19.1	+ 124.0	0.0002
	urban	8/30	26.7	34/146	23.3	- 3.4	- 12.7	0.6925
Abdominal obesity**	total	50/120	41.7	363/1106	32.8	- 8.9	- 21.3	0.0515
	females	29/79	36.7	243/655	33.1	+ 3.6	+ 9.8	0.9459
	males	21/41	51.2	120/451	26.5	- 24.7	- 48.2	0.0008
	rural	42/91	46.2	315/961	32.8	- 13.4	- 29.0	0.0100
	urban	8/29	27.6	48/145	33.1	+ 5.5	+ 19.9	0.5615
Overweight/obesity (BMI ≥25)	total	82/121	67.8	650/1108	58.6	- 9.2	- 13.6	0.0513
	females	50/80	62.5	347/656	52.9	- 9.6	- 15.4	0.1037
	males	32/41	78.0	303/452	66.9	- 11.1	- 14.2	0.1430
	rural	62 / 91	68,1	570 / 963	59,2	-8,9	- 13.1	0.0961
	urban	20 / 30	66,7	80 / 145	55,2	-11,5	- 17.2	0.2469
TC ≥190 mg/dl	total	39/121	32.2	691/1108	62.3	+ 30.1	+ 93.5	<0.0001
	females	22/80	27.5	385/655	58.8	+ 31.3	+ 113.8	<0.0001
	males	17/41	41.5	306/453	67.4	+ 25.9	+ 62.4	0.0008
	rural	30/91	33.0	620/962	64.4	+ 31.4	+ 95.2	<0.0001
	urban	9/30	30.0	71/146	48.6	+ 18.6	+ 62.0	0.0620
Systolic BP ≥140 mmHg	total	50/121	41.3	234/1112	21.0	- 20.3	- 49.2	<0.0001
	females	26/80	32.5	113/658	17.2	- 15.3	- 47.1	0.0009
	males	24/41	58.5	121/454	26.6	- 31.9	- 54.6	<0.0001
	rural	41/91	45.1	199/966	20.6	- 24.5	- 54.3	<0.0001
	urban	9/30	30.0	35/146	24.0	- 6.0	- 20.0	0.4874
Diastolic BP ≥90 mmHg	total	34/121	28.1	182/1112	16.4	- 11.7	- 41.6	0.0012
	females	15/80	18.8	82/658	12.5	- 6.3	- 33.6	0.1160
	males	19/41	46.3	100/454	22.0	- 24.3	- 52.5	0.0005
	rural	28/91	30.8	156/966	16.1	- 14.7	- 47.7	0.0004
	urban	6/30	20.0	26/146	17.8	- 2.2	- 11.0	0.7768
High BP ***	total	58/121	47.9	287/1112	25.8	- 22.1	- 46.1	<0.0001
	females	30/80	37.5	137/658	20.8	- 16.7	- 44.6	0.0008
	males	28/41	68.3	150/454	33.0	- 35.3	- 51.7	<0.0001
	rural	48/91	52.7	240/966	24.8	- 27.9	- 52.9	<0.0001
	urban	10/30	33.3	47/146	32.2	- 1.1	- 3.3	0.9031
SCORE ≥5 %	total	4/99	4.0	107/899	11.9	+ 7.9	+ 197.5	0.0183
	females	2/67	3.0	11/523	2.1	- 0.9	- 30.0	0.6434
	males	2/32	6.3	96/376	25.5	+ 19.2	+ 304.8	0.0145
	rural	3/73	4.1	89/772	11.5	+ 7.4	+ 180.5	0.0518
	urban	1/26	3.8	18/127	14.2	+ 10.4	+ 273.7	0.1457

\* – Pearson's chi-squared test; \*\* – waist circumference ≥102 cm in men and ≥88 cm in women; \*\*\* – Systolic BP ≥140 mmHg and/or Diastolic BP ≥90 mmHg  
 BMI – Body Mass Index; TC – total cholesterol; BP – blood pressure

the mean DBP among people with abnormal values (92.6 vs 94.9 mm Hg; p=0.0183).

In comparison with 1997, in 2008/2009 (taking into account the examined population), the cardiovascular risk assessed

using SCORE tables increased. The percentage of people with high-risk (≥5%) almost tripled in the general population (p=0.0183) and increased 4-fold in men (p=0.0145). In the case of the rural population, the growth (almost 3-fold) did

**Table 3.** Selected risk factors in a healthy population of a rural area in south-eastern Poland between 1997-2008/9 (quantifiable variables)

		n	1997 vs 2008/9 (average ± SD)	change		p*
				absolute (Δ %)	relative (%)	
Smoking [number of cigarettes a day]	total	25 vs 504	17.4 ± 10.1 vs 15.9 ± 9.2	-1.5	-8.6	0.4650
	females	11 vs 211	14.4 ± 4.9 vs 12.5 ± 8.0	-1.9	-13.2	0.2334
	males	14 vs 293	19.8 ± 12.5 vs 18.3 ± 9.3	-1.5	-7.6	0.5215
	rural	16 vs 460	15.9 ± 10.3 vs 15.9 ± 8.9	+0.0	+0.0	0.9469
	urban	9 vs 44	20.0 ± 10.0 vs 15.7 ± 12.0	-4.3	-21.5	0.1387
BMI [kg/m <sup>2</sup> ]	total	121 vs 1108	26.9 ± 4.4 vs 26.5 ± 4.7	-0.4	-1.5	0.2890
	females	80 vs 656	26.6 ± 4.6 vs 26.1 ± 5.0	-0.5	-1.9	0.3288
	males	41 vs 452	27.4 ± 3.8 vs 27.0 ± 4.2	-0.4	-1.5	0.3468
	rural	91 vs 963	27.1 ± 4.4 vs 26.5 ± 4.7	-0.6	-2.2	0.1761
	urban	30 vs 145	26.2 ± 4.2 vs 26.5 ± 4.8	+0.3	+1.1	0.9353
Waist circumference [cm]	total	120 vs 1106	90.3 ± 12.2 vs 88.8 ± 12.5	-1.5	-1.7	0.2138
	females	79 vs 655	86.4 ± 10.6 vs 84.8 ± 12.4	-1.6	-1.9	0.1316
	males	41 vs 451	97.8 ± 11.5 vs 94.5 ± 10.2	-3.3	-3.4	0.0183
	rural	91 vs 961	90.9 ± 12.6 vs 88.7 ± 12.4	-2.2	-2.4	0.1036
	urban	29 vs 145	88.4 ± 10.5 vs 89.1 ± 12.9	+0.7	+0.8	0.6525
TC ≥190 mg/dl [mg/dl]	total	39 vs 691	222.8 ± 31.3 vs 228.8 ± 33.8	+6.0	+2.7	0.1696
	females	22 vs 385	223.2 ± 30.9 vs 228.5 ± 36.1	+5.3	+2.4	0.4743
	males	17 vs 306	222.4 ± 32.7 vs 229.2 ± 30.7	+6.8	+3.1	0.2227
	rural	30 vs 620	217.7 ± 27.8 vs 228.2 ± 33.7	+10.5	+4.8	0.0426
	urban	9 vs 71	240.0 ± 37.6 vs 234.4 ± 34.5	-5.6	-2.3	0.6754
Systolic BP [mm Hg]	total	121 vs 1112	133.4 ± 15.7 vs 126.9 ± 16.1	-6.5	-4.9	<0.0001
	≥140	50 vs 234	148.8 ± 9.4 vs 150.7 ± 11.8	+1.9	+1.3	0.3230
	<140	71 vs 878	122.6 ± 8.4 vs 120.6 ± 10.0	-2.0	-1.6	0.1367
	females	80 vs 658	130.0 ± 15.2 vs 124.2 ± 16.1	-5.8	-4.5	0.0010
	males	41 vs 454	140.1 ± 14.6 vs 131.0 ± 15.2	-9.1	-6.5	<0.0001
	rural	91 vs 966	134.1 ± 15.9 vs 126.8 ± 15.7	-7.3	-5.4	<0.0001
	urban	30 vs 146	131.3 ± 15.1 vs 128.0 ± 18.5	-3.3	-2.5	0.2810
Diastolic BP [mm Hg]	total	121 vs 1112	80.4 ± 10.4 vs 79.7 ± 9.4	-0.7	-0.9	0.1544
	≥90	34 vs 182	92.6 ± 3.9 vs 94.9 ± 5.9	+2.3	+2.5	0.0183
	<90	87 vs 930	75.6 ± 7.8 vs 76.7 ± 6.7	+1.1	+1.5	0.4771
	females	80 vs 658	77.8 ± 9.8 vs 78.0 ± 9.4	+0.2	+0.3	0.7415
	males	41 vs 454	85.5 ± 9.6 vs 82.0 ± 9.0	-3.5	-4.1	0.0063
	rural	91 vs 966	81.2 ± 10.1 vs 79.8 ± 9.0	-1.4	-1.7	0.0710
	urban	30 vs 146	78.0 ± 11.0 vs 78.4 ± 11.7	+0.4	+0.5	0.9060
SCORE [%]	total	99 vs 899	1.2 ± 1.7 vs 1.9 ± 2.5	+0.7	+58.2	0.0024
	females	67 vs 523	0.6 ± 1.1 vs 0.8 ± 1.1	+0.2	+35.3	0.0246
	males	32 vs 376	2.5 ± 1.9 vs 3.5 ± 3.0	+1.0	+39.5	0.1953
	rural	73 vs 772	1.3 ± 1.8 vs 1.8 ± 2.5	+0.5	+39.7	0.0341
	urban	26 vs 127	1.0 ± 1.5 vs 2.4 ± 2.8	+1.4	+134.8	0.0055

\* - Mann-Whitney U test.

SD – standard deviation; BMI – Body Mass Index; TC – total cholesterol; BP - blood pressure.

not reach statistical significance ( $p=0.0518$ ). The average value of the SCORE increased 1.6-fold in the general population ( $p=0.0024$ ), 1.4-fold in women ( $p=0.0246$ ), 1.4-fold in the rural population ( $p=0.0341$ ) and 2.3-fold in the urban population ( $p=0.0055$ ).

1.1% of the respondents in 2008/9 had hyperglycaemia (high fastum glucose in most cases). Only 9.6% of the surveyed individuals in 2008/9 declared satisfactory physical activity.

## DISCUSSION

The presented study evaluated the prevalence of major CVD risk factors in an agricultural region of south-eastern Poland. A significant reduction of the percentage of people with high blood pressure in the area deserves attention. In the opinion of the authors, this is the result, first of all, of a significant improvement in the detection of hypertension in the rural population. In the examined population, the HA prevalence

in 1997 was slightly higher than 44% of the NATPOL II study of the same year [7]. The incidence of occurring of HA in 2008/9, however, was significantly lower than that observed in the WOBASZ study carried out between 2003 – 2005 (on average, 36%: women – 32.9%, men – 42.1%). Comparison of the presented results with the part of WOBASZ study carried out for the Lublin region (HA – 24% – men and women) indicates a more frequent occurrence in the population of HA in men and less common among women [2]; however, direct comparison with the results of Polish epidemiological studies may only be approximate. The main studies referred to the entire population of adults, including those with diagnosed and treated HA (although in most cases, not effectively), they also differed in the methods of measurement, and before 1997 the definition of HA varied. On the other hand, a decrease in the incidence of unrecognized HA was observed, which corresponded with the trends observed in the general population. According to the latest available data (NATPOL 2011), 32% of the population of Poland currently suffers from HA – 29% of women and 35% of men [1].

The significant increase in the percentage of smokers is alarming, especially among men and the rural population. The NATPOL III PLUS study conducted in 2002 established the number of active smokers to be about 34% of adult Poles [8], and in this context the presented data from 1997 seem to be slightly lower, which may be a consequence of the relatively small group. The WOBASZ study estimated the number of active smokers in Poland as 25% of women and 42% of men, a result that differed from the one obtained for the Lublin province only in the case of women (23%) [3]. Nowadays, according to the GATS study (2009/10), 27% of adult Poles (33.5% of men and 21% of women) smoke every day. Additionally, the study distinguishes a group of occasional smokers, about 3% of men and women. In total, everyday and occasional smokers constitute 30.3% of the healthy population – including 36.9% of men and 24.4% of women [9]. The results presented in the current study indicating a higher percentage of male smokers, may result from the low level of education in most cases (according to the GATS 47.4% of men with vocational education in Poland smoke cigarettes, in the presented study population this percentage reached 39.0% in 1997 and 61.4% in 2008/9), and from the fact that the majority of the respondents live in rural areas (GATS – 35.7% of smokers in this group). Thus, a narrower age range was taken into account and included only healthy people in the study [1]. The results of this study may also be shaped in the presented way because of the material status of the population of the eastern provinces of Poland, especially the rural inhabitants, and due to easier access to cheaper cigarettes illegally imported from the east than in other regions. In the presented study, the average number of smoked cigarettes per day is comparable to other publications: 18 for men and 14 for women (18 and 12.5, respectively, in Lublin province) in the WOBASZ study, 18 for men and 16 for women, according to the GATS [1,3].

The prevalence of high levels of TC in 1997, as also in the case of smoking, might be lower. This hypothesis may be supported by the significantly higher percentage of hypercholesterolaemia in the NATPOL III PLUS study (60.7%) [7]. The values reported in the presented study between 2008 – 2009 are comparable for men and slightly higher for women than in the WOBASZ study (67% – men;

64% – women). The current results, however, are much higher when compared with the results of the WOBASZ study for the Lublin province (57% – men; 51% – women) [10]. This may indicate a broader scale of the problem of hypercholesterolaemia among the population in the rural areas than the results show.

The percentage of people with abdominal obesity in the study group was lower than the Polish average (40.4% women, 28.3% of men in the WOBASZ study); in the case of women, the percentage was also lower than the average for Lublin province (37.5% in the WOBASZ study). The results concerning men in the WOBASZ study were poor (20.9%), although the prevalence of abdominal obesity in men decreases. Between 1997 – 2009, the incidence of abnormal weight gain did not change, and the recorded decreasing tendency did not reach statistical significance. Obesity among men was more frequent than in the national population and the province of Lublin (respectively 61.0% and 53.8% in the WOBASZ study). Obesity among women occurred more often than in the national population, as well as in the Lublin province (respectively, 48.1% and 52.0% in the WOBASZ study) [11].

The risk of death from cardiovascular causes, evaluated throughout a 10-year period in accordance with the SCORE algorithm, increased significantly as a result of the increase in this risk among men which, in turn, was a consequence of the increase in the percentage of active smokers. The high risk in the presented study group is even more than twice as likely than in the results of the studies carried out by other authors analyzing the data obtained from PPChUK in other regions of Poland [12].

## CONCLUSIONS

- 1) In the study of a potentially healthy population (without a recognized CVD), 25% of the study population and about 33.3% of males had elevated blood pressure, which proves that the detection of HA in the region in which the survey was carried out is still too low.
- 2) The increasing prevalence of active smoking in the study group indicates that the actions against tobacco addiction should be a major component of the health-education programmes for the rural areas of south-eastern Poland.
- 3) The increased prevalence of risk factors, especially smoking and hypercholesterolaemia, results in a significant increment of the cardiovascular risk among the population (a high 10-year risk of death from cardiovascular causes concerns 25% of males), which is higher than observed in many other regions of the country.

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