

# AWARENESS OF CARDIOVASCULAR PREVENTION METHODS AMONG RESIDENTS OF POST-COMMUNIST POLISH PROVINCES WITH HIGHEST MORTALITY RATES

Małgorzata Pikala<sup>1</sup>, Dorota Kaleta<sup>1</sup>, Wojciech Bielecki<sup>1</sup>, Irena Maniecka-Bryła<sup>1</sup>, Wojciech Drygas<sup>1,2</sup>, Magdalena Kwaśniewska<sup>1</sup>

<sup>1</sup>Department of Preventive and Social Medicine, Medical University of Łódź, Łódź, Poland

<sup>2</sup>Department of Epidemiology, Cardiovascular Prevention and Health Promotion, Institute of Cardiology, Warsaw, Poland

## SUMMARY

**Aim:** The aim of the study was to estimate the awareness of healthy lifestyle behaviours in cardiovascular diseases (CVD) prevention and to find out possible determinants of this knowledge among adult residents of Polish provinces with the highest CVD mortality rates.

**Material and methods:** A cross-sectional analysis of randomly selected representative sample of 2,211 (51.9% women) aged 20–74 years from Łódź and Lublin voivodeships participating in the National Polish Health Survey WOBASZ. Knowledge on CVD prevention, sociodemographic and lifestyle characteristics were collected by an interviewer-administered questionnaire. Blood pressure, anthropometrics, plasma lipids and glucose were measured according to the WHO MONICA protocol.

**Results:** Approximately 68% of participants, had poor awareness of preventive methods and majority of them were not able to name any specific approach. Most often mentioned method of CVD prevention was relaxing/avoiding stress (51.2%). The least known healthy behaviour was a reduction of salt intake and adequate fruit/vegetables consumption, mentioned by 18.2% and 23%, respectively. About 16.4% of women and 23% of men with risk factors of CVD were not aware of any non-pharmacological preventive method. Poor knowledge of CVD prevention was significantly more prevalent among persons aged  $\geq 65$  years, with elementary education level, lower income, living in the rural settings, declaring poor self-rated health. Dietary and physical activity advice given by a primary care physician was significantly related to better knowledge among men with CVD risk factors.

**Conclusions:** There is a need to focus on increasing educational level in this regions, especially in rural settings. Due to important role of primary care physicians in health education, more attention should be paid to individuals with CVD risk factors as their preventive knowledge level is very low and comparable to the level of low-risk individuals.

**Key words:** cardiovascular disease, prevention, socioeconomic factors, health promotion, medical care, Central Europe

**Address for correspondence:** M. Kwaśniewska, Department of Preventive Medicine, Medical University of Łódź, Ul. Żeligowskiego 7/9 90-752 Łódź, Poland. E-mail: magdalena.kwasniewska@umed.lodz.pl

## INTRODUCTION

Cardiovascular diseases (CVD) remain a major cause of death, premature mortality and disability in Poland (1). The mortality rates due to CVD have been declining since the early 1990s as a result of substantial changes in lifestyle and improved medical care. However, there are particular regions of the country with significantly higher total and CVD death rates despite relatively good access to health care and invasive cardiology procedures (2). Previous reports conducted among residents of these regions showed unfavorable lifestyle patterns with very low prevalence of persons following current recommendations on cardiovascular prevention (3–5). Such poor adherence to recommended guidelines may be a function of a deficiency in a level of awareness of CVD preventive methods. Several studies indicated that im-

provement in awareness of CVD risk factors and prevention may be prerequisite for adopting healthy lifestyle behaviours (6, 7).

According to CVD prevention guidelines, clinicians of all specialties should pay special attention to promotion of healthy lifestyle changes and early identification of individuals at high risk (8). The National Polish Multicentre Study WOBASZ showed that physicians were the most reliable source of health information both in the primary and secondary prevention (9).

The objective of the study was to estimate the awareness of healthy lifestyle behaviours and to find out possible determinants of this knowledge in a representative sample of adult residents of Polish provinces with the highest CVD mortality rates. Findings from this analysis may enable to better understand the inequality within a country and help in elaborating effective strategies focused on the reduction of CVD mortality.

## MATERIALS AND METHODS

The study population was obtained from a national random sample of men and women (aged 20–74 years) participating in the National Multicentre Health Survey, WOBASZ. The WOBASZ was conducted in the years 2003–2006 and covered the whole territory of Poland represented by 16 voivodeships. From the whole population of Polish adults aged 20–74 years (26,360,000 individuals), a sample of 19,200 men and women was randomly selected by PESEL (Polish Resident Identification Number) in the Department of Polish Registry of the Ministry of the Interior and Administration. Personal invitations to the study were sent by mail. With the mean response rate being 74.3% in men and 79.3% in women, the whole study enrolled 14,769 individuals. For the purpose of this analysis we included data concerning residents of Łódź and Lublin provinces situated in Central and Eastern Poland ( $n=2,211$ ) collected in 2005/2006. Although both regions have been experiencing important socioeconomic changes due to post-communistic transitions, they still have the highest proportions of persons with low educational level and low socioeconomic factors. In comparison to the national statistics, these regions have had the highest CVD mortality rates (especially in the context of premature deaths among men) and significantly less dynamic decline of CVD mortality since the 1990s.

The final sample comprised 1,149 women and 1,062 men aged 20–74 years (response rate 88.4%) after excluding subjects with incomplete data on the required questions ( $n=263$ ). Informed written consent was obtained from each subject. Detailed description of the WOBASZ Project has been published previously (10, 11). All procedures were carried out by nurses and trained interviewers in selected out-patient clinics and consisted of the following parts: a questionnaire interview, blood pressure (BP) and anthropometric measurements, and a blood sample collection.

The questionnaire included questions on medical history, sociodemographic and economic factors, lifestyle, knowledge of CVD risk factors, medical care, social support, and depression. Cardiovascular diseases were defined as coronary heart disease, heart failure, stroke and peripheral artery disease. Data on medical and family history were self-reported. Socioeconomic and lifestyle data included place of residence (rural, small urban, large urban), educational level (elementary, secondary or university), occupation, monthly household income, smoking, alcohol consumption, physical activity and dietary habits.

The outcome measure regarding the knowledge of CVD prevention was evaluated using an open-ended question: “Do you know any methods of preventing heart diseases other than taking medicaments?” Mentioning less than three methods was interpreted as poor knowledge, while mentioning 3–6 and at least 7 risk factors were interpreted as good and very good knowledge, respectively. Assessment of physician’s counselling on lifestyle was based on the response (yes or not) to the following questions: “During a visit to a primary care doctor, do you usually: a) receive an advice regarding smoking cessation?; b) receive any nutritional advice?; c) receive an advice to increase physical activity?”

All measurements were made according to the standardized protocol of the WHO MONICA Project (1990) (12). Weight and height were measured with participants in light clothing and without shoes. Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters.

Waist circumference was measured with a measuring tape at the middle of the distance between the lowest rib and the iliac crest (in underwear, standing position) to the nearest 0.5 cm. BP was measured twice with a standard automatic sphygmomanometer (Omron M-51) on the right arm after a 5-minute of rest. Fasting lipids and glucose concentrations were determined with INTEGRA 400 system, Roche. Triglycerides (TG) were assayed using an enzymatic colorimetric tests with glycerol phosphate oxidize, high-density lipoprotein cholesterol (HDL-C) using colorimetric test with cholesterol esterase and oxidize modified with polyoxyethylene allylmethyldiether. LDL-cholesterol was estimated by the Friedewald Formula unless  $TG \leq 4.52$  mmol/l. Fasting plasma glucose (FPG) was assessed using enzymatic method with hexokinase. Samples of blood lipids and glucose were processed at the Central Laboratory of Institute of Cardiology in Warsaw.

## STATISTICAL ANALYSES

Statistical analyses were performed with STATISTICA Version 8.0. Descriptive statistics were computed for sociodemographic, lifestyle and clinical variables. Given that the relative importance of the correlates might differ between genders, all the analyses were performed separately for men and women. To compare the frequency and assess statistical significance of the given categories of quantitative characteristics in the analysed groups the chi-square test or the chi-square test with Yates’ correction were implemented. For comparison of continuous parameters the t-test was used. To identify factors that can contribute to poor level of CVD knowledge, univariate analyses based on logistic regression were performed separately for men and women reporting adjusted odds ratios (OR) with 95% confidence intervals (CIs). Variables identified significant by univariate analyses were further used in multivariate logistic regression (backward elimination modelling method). All p-values were two-sided and  $p < 0.05$  was set as statistically significant.

## RESULTS

Descriptive statistics of the study sample are presented in Table 1. Men and women had comparable proportions in the distribution of age, place of residence, occupational status, family history of CVD, PA level, obesity, hypertension and diabetes. A higher percentage of men had elementary education, smoked cigarettes, had elevated glucose, lipid disorders and medical history of CVD. Regarding knowledge of CVD prevention, about 68% of participants had poor awareness of preventive methods and majority of them were not able to name any specific approach. Most often mentioned method of CVD prevention was relaxing (51.2%) and increasing physical activity (50.3%). Smoking cessation and reduction of alcohol consumption was mentioned by 44.1% and 34.5% of respondents, respectively. Significantly more women than men identified a low fat diet, weight reduction, low salt intake and an adequate fruit/vegetables consumption as an effective preventive method. The least known healthy behaviour was a reduction of salt intake which was mentioned by 14% of men and 21.3% of women. Of note, almost one fifth of the study participants were not able to name even one method of CVD

**Table 1. Characteristics of the studied population (n=2,211)**

	Women n=1,149	Men n=1,062
Age, years (mean $\pm$ SD)	45.40 $\pm$ 15.33	45.69 $\pm$ 15.17
Elementary education, n (%)	502 (43.69)	630 (59.28)***
Residents of rural areas, n (%)	364 (31.68)	337 (31.73)
Unemployed, n (%)	206 (17.93)	186 (17.53)
Low income, n (%)	539 (46.91)	503 (47.36)
Poor self-rated health, n (%)	439 (38.21)	348 (32.77)**
Smoking, n (%)	228 (19.84)	417 (39.27)***
Low physical activity level, n (%)	733 (63.79)	639 (60.17)
Calorie intake, kcal/day (mean $\pm$ SD)	1,813.08 $\pm$ 731.32	2,502.10 $\pm$ 1,027.77***
Obesity, n(%) <sup>a</sup>	251 (21.85)	198 (18.64)
Hypertension, n (%) <sup>b</sup>	255 (22.19)	264 (24.86)
Dyslipidemia, n (%) <sup>c</sup>	695 (60.49)	710 (66.85)**
Hyperglycemia, n (%) <sup>d</sup>	153 (13.32)	216 (20.34)***
Diabetes, n (%) <sup>e</sup>	62 (5.40)	65 (6.12)
History of CVD, n (%)	215 (18.71)	271 (25.52)***
Family history of CVD, n (%)	168 (14.62)	141 (13.28)
Attending medical care unit <sup>f</sup> , n (%)	888 (77.28)	692 (65.16)***
Poor CVD knowledge, n (%)	767 (66.76)	748 (70.43)
Good CVD knowledge, n (%)	316 (27.50)	259 (24.39)
Very good CVD knowledge, n (%)	66 (5.74)	55 (5.18)

<sup>a</sup> Body mass index  $\geq 30$  kg/m<sup>2</sup>; <sup>b</sup> systolic blood pressure  $\geq 140$  mm Hg or diastolic blood pressure  $\geq 90$  mm Hg, or treatment for hypertension; <sup>c</sup> total fasting plasma cholesterol  $\geq 5$  mmol/l or triglycerides  $> 1.7$  mmol/l, or treatment for lipid disorders; <sup>d</sup> fasting plasma glucose  $\geq 5.6$  mmol/l; <sup>e</sup> fasting plasma glucose  $\geq 7$  mmol/l, or oral hypoglycemic or insulin use; <sup>f</sup> during the last 12 months.

\*p<0.05, \*\*p<0.01, \*\*\*p<0.001

**Table 2. Awareness of specific preventive methods in the whole studied group and among persons with CVD risk factors, by sex**

	Smokers	Hypertensive	Obese	Dyslipidemic	Hyperglycemic	Overall
Women						
Smoking cessation, %	57.9	34.9	39.4	42.9	45.1	43.7
Weight reduction, %	28.9	37.6	41.0	31.8	42.5	31.3
Low fat diet, %	34.6	38.4	39.0	38.0	39.9	38.1
Adequate fruit/vegetables intake, %	30.2	28.6	25.1	27.1	31.4	27.0
Reduction of alcohol consumption, %	32.9	29.8	33.1	33.1	29.4	34.4
Reduction of salt intake, %	19.7	23.9	20.3	21.9	24.8	21.3
Adequate physical activity, %	49.1	48.2	43.0	50.8	51.6	51.3
Relaxing, avoiding stress, %	57.0	53.7	52.2	55.7	49.0	56.6
None, %	16.2	17.3	15.5	15.7	17.0	15.6
Men						
Smoking cessation, %	53.7	47.0	42.9	43.5	50.0	44.5
Weight reduction, %	18.2	27.7	32.8	24.1	29.6	24.1
Low fat diet, %	29.5	38.6	33.3	32.8	38.4	33.5
Adequate fruit/vegetables intake, %	16.5	20.1	20.7	20.3	19.9	19.8
Reduction of alcohol consumption, %	34.3	36.7	35.4	34.6	36.1	34.8
Reduction of salt intake, %	12.7	16.7	14.1	13.4	18.1	14.0
Adequate physical activity, %	43.4	46.6	48.5	48.7	50.0	45.3
Relaxing, avoiding stress, %	41.0	43.6	43.9	45.5	52.8	48.8
None, %	25.9	20.5	23.7	23.0	20.8	22.7

**Table 3.** Odds ratios (OR) and 95% confidence intervals (CI) for poor knowledge of CVD prevention according to sociodemographic, lifestyle and clinical factors, by sex

	OR (95% CI)	
	Women	Men
Age (years)		
20–34	1.00	1.00
35–64	1.16 (0.88–1.52)	1.35 (1.01–1.82)*
≥65	3.15 (1.97–5.03)***	2.12 (1.33–3.39)***
Education		
Elementary	3.25 (2.28–4.64)***	2.20 (1.49–3.23)***
Secondary	1.69 (1.20–2.39)*	1.44 (0.95–2.19)
University	1.00	1.00
Place of residence		
Rural	1.00	1.00
Urban	0.33 (0.17–0.77)**	0.25 (0.09–0.40)***
Employment		
Unemployed	1.00	1.00
Employed	0.94 (0.65–1.36)	1.00 (0.68–2.34)
Income (Euros/month)		
≤260	1.00	1.00
>260	0.60 (0.37–0.97)*	0.47 (0.31–0.70)**
Self-rated health		
Poor	1.00	1.00
Good	0.71 (0.55–0.93)*	0.88 (0.65–1.18)
Very good	0.55 (0.33–0.90)*	0.57 (0.35–0.93)*
Family history of CVD		
Yes	0.88 (0.62–1.24)	0.91 (0.62–1.34)
No	1.00	1.00
Low physical activity		
Yes	0.74 (0.58–0.96)*	0.80 (0.61–1.04)
No	1.00	1.00
Smoking		
Yes	0.95 (0.70–1.29)	1.13 (0.86–1.48)
No	1.00	1.00
Obesity		
Yes	1.13 (0.66–1.62)	0.89 (0.51–1.99)
No	1.00	1.00
Hypertension		
Yes	1.19 (0.88–1.62)	1.00 (0.90–1.12)
No	1.00	1.00
Dyslipidemia		
Yes	1.27 (0.78–1.76)	0.89 (0.55–1.59)
No	1.00	1.00
Diabetes		
Yes	1.08 (0.76–1.67)	1.14 (0.49–1.43)
No	1.00	1.00

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

prevention (Table 2). Among participants with specific CVD risk factors, most commonly identified method was smoking cessation among smokers (57.9% of women and 53.7% of men). Hypertensive, obese and hyperlipidemic patients were less likely to be aware of their most effective preventive methods. Regardless of existing risk factors, women most often mentioned relaxing/avoiding stress as an effective prevention method. Among men only 16% of patients with hypertension mentioned reduction of salt intake and one third of patients with lipid disorders named low fat diet. About 16.4% of women and 23% of men with risk factors of CVD were not aware of any non-pharmacological method of CVD prevention. Importantly, the highest proportion of such persons were found among male smokers.

According to the univariate logistic regression analysis poor knowledge of CVD prevention was significantly related to older age, lower educational level, lower income, living in the rural settings, poor self-rated health and low physical activity level (Table 3). After adjusting for possible confounders in the multivariate model (all parameters specified in the table), most of the relationships remained significant, except for the correlation with secondary education (OR=1.75; 95% CI 1.18–2.57; p=0.06) and good self-rated health (OR=1.85; 95% CI 0.45–1.17; p=0.07) in women.

Table 4 shows the probability of poor CVD prevention knowledge among participants with specific risk factors according to the physician's advice on healthy lifestyle. Overall, most of persons with CVD risk factors declared that they had not discussed lifestyle behaviours with their physicians during office visits. Less than 50% of smokers received no advice on smoking cessation. Approximately 25% of overweight/obese individuals were given no dietary or physical activity advice.

The univariate logistic regression analysis revealed that a physician's counselling was significantly associated with lower likelihood of poor knowledge among men, whereas among women this relationship was noted only for hypertensive subjects. However, the multivariate logistic regression showed that dietary advice was not independently related to CVD prevention knowledge among hypertensive patients (OR 1.49, 95% CI 1.07–3.21 for men; OR 1.44, 95% CI 1.09–3.11 for women; p=0.06).

## DISCUSSION

The main findings of this study include observation that a general knowledge of non-pharmacological methods of CVD prevention is poor and is associated with some sociodemographic, but not lifestyle or clinical factors. Almost half of the study participants were not able to name any of preventive approaches. Relaxing/avoiding stress was most commonly mentioned as an effective CVD prevention method in both sexes. Except for smokers, persons with hypertension, obesity, lipid and glucose disorders had poor knowledge concerning their particular risk factors. Little proportion of the respondents was given healthy lifestyle advice, especially in the context of increasing physical activity level. However, such an advice was associated with better knowledge mostly among men.

The results generated from this representative sample illustrate the level of CVD prevention knowledge among the residents of regions with the most unfavourable CVD mortality data in Poland. It was the first community health survey that included adults aged

**Table 4.** Odds ratios (OR) and 95% confidence intervals (CI) for poor knowledge of cardiovascular diseases prevention according to physician's advice, by sex

	OR (95% CI)			
	Dietary advice		Physical activity advice	
	Yes	No	Yes	No
<b>Women</b>				
Hypertension	1.00	1.83 (1.07–3.16)*	1.00	2.18 (1.19–3.96)*
N=255	(42.3%)	(57.7%)	(24.1%)	(75.9%)
Smoking	1.00	1.83 (0.94–3.57)	1.00	1.83 (0.79–4.26)
N=228	(7.6%)	(92.4%)	(11.3%)	(88.7%)
Overweight/obesity	1.00	1.20 (0.83–1.73)	1.00	1.43 (0.93–2.20)
N=587	(32.1)	(67.9%)	(18.5%)	(81.5%)
Dyslipidemia	1.00	1.22 (0.86–1.74)	1.00	1.46 (0.94–2.28)
N=695	(26.2%)	(73.8%)	(13.5%)	(86.5%)
Hyperglycemia	1.00	1.29 (0.66–2.52)	1.00	1.94 (0.94–3.98)
N=153	(49.2%)	(50.8%)	(29.4%)	(70.6%)
<b>Men</b>				
Hypertension	1.00	1.89 (1.10–3.25)*	1.00	2.48 (1.40–4.40)**
N=264	(38.2%)	(61.8%)	(27.1%)	(72.9%)
Smoking	1.00	1.77 (1.04–3.02)*	1.00	2.21 (1.21–4.02)**
N=417	(17.2%)	(82.8%)	(12.4%)	(87.6%)
Overweight/obesity	1.00	1.50 (1.04–2.17)*	1.00	1.87 (1.25–2.79)**
N=625	(28.6%)	(71.4%)	(20.8%)	(79.2%)
Dyslipidemia	1.00	1.54 (1.06–2.24)*	1.00	1.86 (1.24–2.81)**
N=710	(23.0%)	(77.0%)	(16.7%)	(83.3%)
Hyperglycemia	1.00	1.28 (0.72–2.30)	1.00	2.36 (1.27–4.38)**
N=216	(37.2%)	(62.8%)	(27.7%)	(72.8%)
<b>Advice on smoking cessation</b>				
Smokers	Yes		No	
Women	1.00		1.45 (0.83–2.53)	
N=228	(49.2%)		(50.8%)	
Men	1.00		1.20 (0.78–1.86)	
N=417	(47.7%)		(52.3%)	

20–74 years living in rural, small urban and large urban settings. These findings may point out future priorities for effective interventional projects and their outcome measures.

The disparity in knowledge of CVD prevention that we observed across age and education groups are in line with other studies that have indicated substantially lower level of CVD awareness among individuals over 65 years old and having elementary education (13, 14, 15). Even after adjusting for other variables lower educated subjects had almost 3-fold higher likelihood of poor knowledge as compared to persons with at least secondary education. Lack of satisfactory knowledge was also significantly more prevalent among middle-aged men which seems very important in the context of high premature CVD mortality rates among men living in this regions. Moreover, regarding the fact that these regions have the highest prevalence of persons with elementary education and low socioeconomic status in the country, focusing

on improving health by increasing educational level seems to be the priority for health promoters.

For the first time, we could assess the level of knowledge according to the place of residence. The obtained results were similar in both sexes and revealed that people living in the country had substantially worse knowledge than residents of urban settings. Rural areas in many parts of the world are facing issues such as economic restructuring, environmental degradation, aging, and depopulation. A survey of rural health experts and practitioners in the United States found that access to health services was still among the overwhelming priority and had a crucial impact on health and quality of life of the rural communities (16). According to the results of our study only 34% of persons living in the rural communities visited their physicians within the last 12 months which illustrates a limited access to medical care and might have a substantial influence on CVD knowledge and behaviours.



The most concerning issue was the lack of awareness seen among patients with particular CVD risk factors. Being a smoker, hyperlipidemic, obese or hypertensive have not influenced significantly the level of knowledge on CVD prevention. Of note, only about 17% of men with hypertension mentioned a reduction of salt intake as a CVD preventive method. Relaxing/avoiding stress was much more important than a low-fat diet for patients with hyperlipidemia or weight reduction for the obese subjects.

These results are to some extent similar to those obtained in other countries indicating very low awareness of CVD risk factors and behaviours among high-risk individuals (17, 18, 19). Health education programs should, therefore, focus on raising ability to identify at least one specific preventive method by persons with CVD risk factors since this elementary knowledge is necessary for successful behaviour modification (16). In view of the fact that each year approximately three thirds of residents of the analyzed regions see their physicians, primary care clinics seem to be an ideal place for health promotion and behavioural education. In our study, advice on diet or physical activity given by primary care doctors was associated with substantially lower likelihood of poor CVD prevention knowledge, particularly among men. However, about 34% of the study participants did not receive any advice on CVD prevention from their physicians and only 55% of regular smokers discussed with their physicians issues concerning tobacco addiction and effective methods of smoking cessation. The least often prevention advice given by physicians regarded increasing the level of physical activity. Only 17% of respondents (more often men than women) were counselled about the role of adequate training programs in the prevention and treatment of CVD. Although health education as an important part of medical care has been recommended by several experts' committees, the level of counselling on CVD prevention is far from satisfactory even in countries with well established preventing strategies (20–26). A survey performed among U.S. physicians on their attitudes and barriers in primary prevention revealed low interest in health education. Due to limited time, they focused mainly on diagnosis, treatment and secondary prevention with its more spectacular effects. They believe that healthy lifestyle counselling should be a major responsibility of other health professionals, like dietiticians, nurses etc. (27). It would be necessary to conduct such surveys in our region in order to determine physicians' views on their role in health education and prevention strategies. Regarding the lack of correlation between receiving an advice on healthy behaviours and CVD prevention knowledge, especially among women and smokers, more efforts should be made to rise effectiveness of such counselling in this particular groups.

Some study limitations need to be emphasized. The cross-sectional design of the study does not allow to determine the direction of the causality. Well-known limitation is also the possibility of recall bias due to self-reported data. Moreover, we were not able to investigate a possible barriers to CVD prevention as such questions were not included in the questionnaire. We will include these issues into a new questionnaire for the next edition of WOBASZ which should begin within a few months.

Despite the above limitations, these data indicate that the knowledge on CVD prevention remains in significant relation to some socio-demographic, but not lifestyle and clinical factors in the studied group. A large randomly-selected sample, a population based design, high response rate and inclusion of both genders

across a wide age range in rural and urban settings in this study increases generalizability of the results. Our findings could be of particular importance for other middle-income developing countries in socioeconomic transition.

In summary, our results highlight the strongest relationship between age, education and place of residence, and an awareness of evidence-based non-pharmacological methods in CVD prevention in the regions with most unfavourable mortality trends in Poland. Therefore, there is a need to focus on increasing educational level in this regions, especially in rural settings. Moreover, primary care physicians play an important role in health education, particularly among men, but their engagement in lifestyle counselling during office visits is insufficient according to current standards. Special attention should be paid to subjects with CVD risk factors as their preventive knowledge level is very low and comparable to the level of low-risk individuals.

#### Acknowledgement

The Projects was supported by the Polish Ministry of Health – Programme POLKARD 2003-2005.

**Conflicts of interest:** None declared.

#### REFERENCES

- Maniecka-Bryła I, Bryła M, Drygas W. The epidemiological situation of cardiovascular diseases in the Lodz region compared to Poland at the beginning of the 21st century. *Przegl Epidemiol.* 2005;59(4):923-32. (In Polish.)
- Rywik SL, Piotrowski W, Rywik TM, Broda G, Szcześniewska D. Is the decrease of cardiovascular mortality in Poland associated with the reduction of global cardiovascular risk related to changes in life style? *Kardiologia Pol.* 2003 May;58(5):344-55; discussion: 355.
- Kwaśniewska M, Kaleta D, Dżiankowska-Zaborszczyk E, Drygas W. Healthy behaviours, lifestyle patterns and sociodemographic determinants of the metabolic syndrome. *Cent Eur J Public Health.* 2009 Mar;17(1):14-9.
- Kwaśniewska M, Kaleta D, Dżiankowska-Zaborszczyk E, Drygas W, Makowiec-Dąbrowska T. Lifestyle index and self-rated health status. *Int J Occup Med Environ Health.* 2007;20(4):349-56.
- Kwaśniewska M, Bielecki W, Kaczmarczyk-Chałas K, Małgorzata P, Drygas W. Prevalence of healthy lifestyle in adult residents of Łódź and Lublin voivodeships-project WOBASZ. *Przegl Lek.* 2007;64(2):61-4. (In Polish.)
- Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. *Prog Behav Modif.* 1992;28:183-218.
- Stelmach W, Kaczmarczyk-Chałas K, Bielecki W, Drygas W. How education, income, control over life and life style contribute to risk factors for cardiovascular disease among adults in a post-communist country. *Public Health.* 2005 Jun;119(6):498-508.
- Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, et al.; European Society of Cardiology (ESC); European Association for Cardiovascular Prevention and Rehabilitation (EACPR); Council on Cardiovascular Nursing; European Association for Study of Diabetes (EASD); International Diabetes Federation Europe (IDF-Europe); European Stroke Initiative (EUSI), et al. European guidelines on cardiovascular disease prevention in clinical practice: full text. *Eur J Cardiovasc Prev Rehabil.* 2007 Sep;14 Suppl 2:S1-113.
- Piwońska A, Piotrowski W, Broda G. Ten-year risk of fatal cardiovascular disease in the Polish population and medical care. Results of the WOBASZ study. *Kardiologia Pol.* 2010 Jun;68(6):672-7.
- Broda G, Rywik S. Multi-center all-Polish health survey - WOBASZ project: defining the problem and aims of the study. *Polish Population Review.* 2005;27:29-38.
- Rywik S, Kupś W, Piotrowski W, et al. Multi-center all-Polish health survey - WOBASZ project: methodological assumption and logistics. *Polish Population Review.* 2005;27:37-50.

12. WHO MONICA Project. MONICA manual: cardiovascular disease. Geneva: WHO; 1990.
13. Stelmach W, Kaczmarczyk-Chalas K, Bielecki W, Stelmach I, Drygas W. How income and education contribute to risk factors for cardiovascular disease in the elderly in a former Communist country. *Public Health*. 2004 Sep;118(6):439-49.
14. Wong BM, Garcia Y, Barr A, Glazier RH, Abramson BL. Cardiovascular risk factor awareness in a disadvantaged inner-city population-implications for preventive strategies. *Can J Cardiol*. 2008 Sep;24(9):677-82.
15. Mosca L, Jones WK, King KB, Ouyang P, Redberg RF, Hill MN; American Heart Association Women's Heart Disease and Stroke Campaign Task Force. Awareness, perception, and knowledge of heart disease risk and prevention among women in the United States. *Arch Fam Med*. 2000 Jun;9(6):506-15.
16. Gamm LD, Hutchison LL, Dabney BJ, Dorsey AM, editors. Rural healthy people 2010: a companion document to Healthy People 2010. Vol 1. College Station: The Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center; 2003.
17. Dodani S, Mistry R, Khwaja A, Farooqi M, Qureshi R, Kazmi K. Prevalence and awareness of risk factors and behaviours of coronary heart disease in an urban population of Karachi, the largest city of Pakistan: a community survey. *J Public Health (Oxf)*. 2004 Sep;26(3):245-9.
18. Andersson P, Sjöberg RL, Ohrvik J, Leppert J. Knowledge about cardiovascular risk factors among obese individuals. *Eur J Cardiovasc Nurs*. 2006 Dec;5(4):275-9.
19. Celentano A, Palmieri V, Panico S, Russo C, Arezzi E, Pezzullo S, et al. Individuals' cardiovascular risk profile projected by family doctors and individuals' knowledge of cardiovascular risk factors: a challenge for primary prevention. The cardiovascular risk prevention project "Help Your Heart Stay Young". *Ital Heart J*. 2005 Jul;6(7):557-64.
20. Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. *Prog Behav Modif*. 1992;28:183-218.
21. Pommerenke FA, Weed DL. Physician compliance: improving skills in preventive medicine practices. *Am Fam Physician*. 1991 Feb;43(2):560-8.
22. Flocke SA, Stange KC, Goodwin MA. Patient and visit characteristics associated with opportunistic preventive services delivery. *J Fam Pract*. 1998 Sep;47(3):202-8.
23. Legato MJ, Padus E, Slaughter E. Women's perceptions of their general health, with special reference to their risk of coronary artery disease: results of a national telephone survey. *J Womens Health*. 1997 Apr;6(2):189-98.
24. Centers for Disease Control and Prevention (CDC). Missed opportunities in preventive counseling for cardiovascular disease - United States, 1995. *MMWR Morb Mortal Wkly Rep*. 1998 Feb 13;47(5):91-5.
25. Podl TR, Goodwin MA, Kikano GE, Stange KC. Direct observation of exercise counseling in community family practice. *Am J Prev Med*. 1999 Oct;17(3):207-10.
26. Braun BL, Fowles JB, Solberg LI, Kind EA, Lando H, Pine D. Smoking-related attitudes and clinical practices of medical personnel in Minnesota. *Am J Prev Med*. 2004 Nov;27(4):316-22.
27. Mirand AL, Beehler GP, Kuo CL, Mahoney MC. Explaining the deprioritization of primary prevention: physicians' perceptions of their role in the delivery of primary care. *BMC Public Health*. 2003 May 2;3:15.

*Received March 2, 2011*

*Accepted in revised form August 12, 2011*