



Changes in the Lifestyle and Metabolic Disorders in the Representative Group of Polish Adults in the Years 2003-2014

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Abstract

Introduction: Monitoring temporal changes in the prevalence of most important behaviours and clinical characteristics seems crucial for creating effective health promotion interventions.

Aim: The main purpose of this analysis was to estimate ten-years changes in the lifestyle characteristics and metabolic components in a representative sample of Polish adults.

Material and methods: A sample of 2381 (1099 men) participants of the WOBASZ and WOBASZ II Projects aged ≥ 20 years old was analysed in the context of 10-year changes (2003-2014) in lifestyle and metabolic characteristics. Smoking and physical activity were analysed by interview. Anthropometric data, blood pressure, serum concentration of glucose and lipids were analysed by standard methods. Metabolic syndrome (MetS) was diagnosed using the International Diabetes Federation definition.

Results: The percentage of adult smokers declined substantially both in men and women in the studied period. The analysis of leisure-time physical activity level revealed that the prevalence of participants being active on most days of week decreased in both genders in the years 2003-2014. The percentage of women with waist circumference above 80 cm changed from 59.2 to 67.5% ($p < 0.01$). In men, waist circumference above 94 cm increased from 46.8 to 54.3% in 10-year observation ($p < 0.05$). Of other metabolic characteristics, significant changes were observed in both genders, especially in glucose concentration ($p < 0.001$). Moreover the percentage of persons with elevated blood pressure increased, especially in women ($p < 0.001$) (Table 3). The prevalence of MetS also increased importantly, in women from 23.7 to 28.9% between the surveys ($p < 0.01$) while in men from 31.4 to 37.8% ($p < 0.05$).

Conclusion: *Most of analyzed behaviors and clinical characteristics have worsened in recent years in Poland. As premature mortality in Poland is still high, caused mainly by cardiovascular diseases, it seems crucial to elaborate novel strategies focused on the prevention of metabolic syndrome.*

Key words: *lifestyle, physical activity, metabolic syndrome*

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Introduction

Unhealthy behaviours, mainly sedentary lifestyle and tobacco smoking, are responsible for the epidemic prevalence and mortality of chronic noncommunicable diseases [1-4]. On the other hand, there is increasing body of evidence that a healthy lifestyle can have positive effects on the cardiovascular and metabolic status, all-cause mortality as well as work ability and quality of life [6-10].

Metabolic syndrome (MetS) is a pathophysiological cluster of risk factors predisposing to increased risk of mortality due noncommunicable diseases [11]. Many different definitions have been used, but generally a combination of three or more components should be verified: central obesity, elevated triglycerides, low HDL – cholesterol, elevated blood pressure and high fasting blood glucose. According to the findings of Hu et al. persons with the MetS have an increased risk of death from all causes as well as cardiovascular diseases [12]. Healthy lifestyle including non-smoking and sufficient physical activity (PA) may provide substantial cardiometabolic benefits [13-15].

Monitoring temporal changes in the prevalence of most important behaviours seems crucial for creating more effective health promotion strategies. Data on trends in lifestyle and clinical parameters from middle-income countries are less known.

Therefore, the purpose of this study was to estimate ten-years changes in the lifestyle characteristics and metabolic components in a representative sample of Polish adults.

Material and methods

Participants

Analyzed data were taken from two nationwide cross-sectional surveys: Multi-Centre National Population Health Examination Survey WOBASZ (2003-2005) and WOBASZ II (2013-2014). The study sample consisted of the randomly selected adult residents of three administrative areas of

Poland (Lodz, Silesian and Lublin voivodeship) participating in above two surveys. These regions were selected as those where the mortality statistics due to CVD are among the highest in the country.

The WOBASZ projects were conducted by the Institute of Cardiology in Warsaw in cooperation with 5 medical Polish universities. The aims and methods of the studies were described in previous papers [16,17]. After eliminating participants with incomplete data, the study group involved 1099 men (784 in WOBASZ and 315 in WOBASZ II) and 1282 women (873 in WOBASZ and 409 in WOBASZ II) aged ≥ 20 years old.

Data collection

All procedures were conducted by the specialized professionals (nurses, health educators, trainers). The methodology was elaborated on the basis of the WHO MONICA protocol [18] and comprised: a questionnaire interview, anthropometric blood pressure, heart rate measurements, and a blood sample collection. The study questionnaire contained extensive questions on medical history, socio-economic variables, health knowledge, behaviours, lifestyle, nutrition, social support and depression. In the current assay the following sociodemographic factors were considered: age, residential status, educational degree, marital status, smoking. The subjects were divided into the three groups of place of residence according to the number of residents in their living area [16,17].

People who had never smoked and ex-smokers were included to the group of non-smokers.

Physical activity evaluation was based on the WHO MONICA record and CINDI Health Monitor Questionnaire. Similar set of questions was used in previous studies carried out in Polish population [14,15,19]. Data on leisure-time PA were self-reported. The examples of questions concerning leisure-time PA are as follows: "Do you regularly do physical exercises (for ex. running, walking, swimming, cycling, gymnastics, gardening etc.) for at least 30 minutes per day?" The possible answers were: "yes" or "no". Those who answered "yes" were asked: "How often are you physically active?" There were six possible answers: "everyday", "4-6 days

per week”, “Every second or every third day per week”, “once a week”, “two or three times per month”, “once a month or less frequent”. Persons who did not admit to do any physical activities in their leisure time were classified as “physically inactive” and asked about the reasons of sedentary lifestyle [15].

Metabolic syndrome was determined as having three out of the following five factors: (1) central obesity (WC ≥ 94 cm in men and ≥ 80 cm in women; (2) triglycerides ≥ 1.7 mmol/l (150 mg/dl), or specific treatment for this lipid abnormality; (3) HDL-C < 1.03 mmol/l (40 mg/dl) in males, < 1.29 mmol/l (50 mg/dl) in females, or specific treatment for this lipid abnormality; (4) systolic blood pressure (SBP) ≥ 130 mmHg or diastolic blood pressure (DBP) ≥ 85 mm Hg, or treatment of previously diagnosed hypertension; and (5) fasting blood glucose (FG) ≥ 5.6 mmol/l (100 mg/dl), or previously diagnosed and treated diabetes [13].

The study protocol was accepted by the ethical Committee of the Institute of Cardiology in Warsaw. Informed written consent was obtained from each participant.

Statistical analyses

To compare the incidence and evaluate statistical significance of the categories of quantitative characteristics in the analysed groups the chi-square test was implemented. Given that the potential correlates might differ between genders, all the analyses were performed separately for men and women. All p values were two-sided and $p < 0.05$ was set as statistically significant. Statistical analyses were performed using STATISTICA Windows XP version 12.

Results

Among all 2381 adult individuals, 53.8% were women. The majority of participants were middle-aged, with secondary education, residents of smaller cities.

The analysis of leisure-time physical activity level revealed that the percentage of participants declaring active lifestyle on most days of week decreased between the studies in both genders (Table 1 and 2). In the studied population of women the percentage of sufficiently active persons fell from 32.5 to 28.6% ($p < 0.05$). None PA increased from 33.7% to 40.6% among men and from 38.6% to 44% among women ($p < 0.05$). In the same time, the prevalence of those who did not exercise at all increased from 38.6% to 44% between the surveys ($p < 0.05$) (Tab.1). Importantly, more than 57% of women aged > 65 years old were inactive in the latest edition of the WOBASZ study which was substantially more than 10 years earlier (57.1 vs 51.2%, $p < 0.05$) (data not shown).

In men, the observed changes were even more visible (Tab. 2). The percentage of subjects practicing in the exercises on most days of week decreased from 37.4 to 25.1% in ten-year observation ($p < 0.001$). In the same time there was a significant increase of the percentage of sedentary men as about 40.6% in 2013-14 declared doing no exercises in their free time as compared to 33.7% ten years earlier ($p < 0.01$). The fall in the percentage of physically active men was even more pronounced among young and middle-aged persons as it decreased from 38.9 to 23% between the surveys ($p < 0.001$) (data not shown).

The percentage of current smokers changed substantially between the studies in both genders (Table 2 and 3). Over a decade, the percentage of adult smokers aged between 20 and 74 years significantly declined, both for men and women. An increase in the percentage of current smokers was observed only among women aged above 64 years old (2.3% vs 8.8%, WOBASZ vs WOBASZ II, respectively; $p < 0.05$). The prevalence of ex-smokers increased between the surveys in both genders (30% vs 24% in men and 17.6% vs 19.6% in women, WOBASZ and WOBASZ II, respectively).

The analysis of the anthropometric characteristics showed significant changes mainly in the population of studied women. The mean values of BMI and waist circumference increased substantially between the surveys ($p < 0.05$) (Table 2). The percentage of women with waist circumfe-

rence above 80 cm changed from 59.2 to 67.5 % ($p < 0.01$). In men, waist circumference above 94 cm increased from 46.8 to 54.3% in 10-year observation ($p < 0.05$) (Table 3).

Of other metabolic characteristics, significant changes were observed in both genders, especially in glucose concentration ($p < 0.001$ in both men and women). Moreover the percentage of persons with elevated blood pressure increased, especially in women ($p < 0.001$) (Table 3). The prevalence of MetS also increased importantly, in women from 23.7 to 28.9% between the surveys ($p < 0.01$) while in men from 31.4 to 37.8% ($p < 0.05$) (Table 4).

Table 1. Changes in physical activity level and smoking among women participating in the WOBASZ surveys

Health behavior	Women n=1282			
	WOBASZ (2003-2005) n=873		WOBASZ II (2013-14) n=409	
	n	%	n	%
Smoking status				
Smokers	199	22.8	69	16.9*
Ex-smokers	154	17.6	80	19.6
Leisure time physical activity				
≥ 4 days/wk	284	32.5	117	28.6*
1-3 days/wk				
0 days/wk	337	38.6	180	44.0*

* $p < 0.05$

Table 2. Changes in physical activity level and smoking among men participating in the WOBASZ surveys

Health behaviour	Men n=1099			
	WOBASZ (2003-2005) n=784		WOBASZ II (2013-2014) n=315	
	n	%	n	%
Smoking status				
Smokers	318	40.6	100	31.8**
Ex-smokers	235	30.0	107	34.0
Leisure time physical activity				
≥ 4 days/wk	293	37.4	79	25.1***
1-3 days/wk				
0 days/wk	264	33.7	128	40.6**

p<0.01, *p<0.001

Table 3. Changes in metabolic components among women in the years 2003-2014

Metabolic components	Women	
	2003-205	2013-2014
Waist circumference, cm; mean ± SD	84.9 ± 13.8	86.5 ± 13.3*
Waist circumference ≥ 80 cm; %	59.2	67.5**
Triglycerides, mg/dl; mean ± SD	115.8 ± 77.1	118.4 ± 66.9
Triglycerides ≥ 150 mg/dl or treatment; %	23.6	30.3
HDL-C, mg/dl; mean ± SD	59.0 ± 14.6	57.0 ± 16.9
Systolic blood pressure, mmHg, mean ± SD	127.8 ± 20.6	128.73 ± 19.0
Diastolic blood pressure, mmHg, mean ± SD	79.6 ± 9.8	81.2 ± 11.3*
BP ≥ 130/85 mmHg or treatment, %	28.5	41.3***
Fasting blood glucose, mg/dl; mean ± SD	88.2 ± 28.8	97.2 ± 32.4***
Fasting blood glucose ≥ 100 mg/dl, %	13.6	23.5***
BP ≥ 130/85 mmHg or treatment, %	28.5	41.3
Metabolic syndrome, %	23.7	28.9**

*p<0.05, **p<0.01; ***p<0.0001

Table 4. Changes in metabolic components among men in the years 2003-2014

Metabolic components	Men	
	2003-2005	2013-2014
Waist circumference, cm; mean \pm SD	94.8 \pm 11.8	96.4 \pm 12.1
Waist circumference \geq 94 cm; %	50.5	55.9*
Triglycerides, mg/dl; mean \pm SD	147.8 \pm 125.1	143.4 \pm 85.1
Triglycerides \geq 150 mg/dl or treatment; %	33.4	38.4
HDL-C, mg/dl; mean \pm SD	52.0 \pm 14.9	48.2 \pm 15.2***
Systolic blood pressure, mmHg, mean \pm SD	132.7 \pm 17.7	137.3 \pm 18.6***
Diastolic blood pressure, mmHg, mean \pm SD	80.7 \pm 10.6	83.8 \pm 11.5***
BP \geq 130/85 mmHg or treatment, %	35.3	41.6
Fasting blood glucose, mg/dl; mean \pm SD	91.8 \pm 28.8	102.6 \pm 29***
Fasting blood glucose \geq 100 mg/dl, %	18.5	36.5***
BP \geq 130/85 mmHg or treatment, %	35.3	41.6
Metabolic syndrome, %	31.4	37.1*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.0001$

Discussion

This article presents ten-year changes in lifestyle behaviors and metabolic components among adults in Poland. While analyzing the lifestyle behaviors, the most annoying results concern the substantial decline in physical activity level. A visible increase of sedentary behaviour was observed in both genders, but the most unfavorable changes were observed in men. The disturbing trend was found also among persons active on most days of week. In the same period, most of the metabolic characteristics worsen, probably as a consequence of inappropriate lifestyle.

As compared to lifestyle trends in other countries, quite similar changes were noticed in Brazil, where the percentage of insufficiently active adults increased from 41.1% to 54% between 2002 and 2012 [6]. An increase of physical activity was observed among high-income countries such as Spain, Finland and Canada [7,8,9]. A relevant growth of physical activity was noticed in Finland between 1982 and 2012. A percentage of physical activity in leisure time increased from 21% to 33% in men and from 12% to 27% in women [20]. In the Central and Eastern Europe, only

in the Czech Republic a percentage of sufficiently active habitants was on the nicely level and exceed 46% [21]. According to the Nationwide Study of Occurrence of Risk Factors of Cardiovascular Diseases showed that over 39% of Polish subjects was physically active on most days of week [22].

Importantly, the most disturbing results of this analysis concern the highest prevalence of physical inactivity among young middle-aged men. As Poland is still a country with high premature mortality in men, these findings are of particularly significant. Several previous Polish reports showed that cardiovascular diseases are the most important contributor to overall health statistics, including premature mortality [8,23]. Thus it seems crucial to modify the risk of CVD, including physical inactivity which is one of the most recognized CVD risk factors.

While analyzing the metabolic status over the 10-year period, we observed a deterioration of most analysed characteristics. Although compared to the United States or some other westerns societies, the problem of obesity in Poland is less common [12], the distribution of body mass by the BMI category has shifted toward higher values, resulting in a relevant increase in the prevalence of obesity. According to the NCD Risk Factor Collaboration, between 1975 and 2014, the rise of the mean BMI was noticed in both genders [24]. In this study, the most statistically significant changes were found among women, especially in the context of the prevalence of obesity. Although in the whole population of studied men the mean values of anthropometric features were rather stable, the significant increase in the BMI and abdominal obesity was noticed among young and middle-aged men.

Lipid profile also changed unfavorably, mainly in triglycerides and HDL-C concentration. Interestingly, data obtained from the United States National Health and Nutrition Examination Survey showed a downward trend for median TG levels and stable HDL-C levels in both gender in recent years [25]. Results from National Health Surveys 1997-1999 and 2008-2011 conducted among adults in Germany demonstrated a decrease of total cholesterol by 13% in men and 12% in women and trigly-

cerides level by 14% in men and 8% in women. However, a concentration of HDL-cholesterol declined only among women. The favorable changes in total cholesterol and triglycerides levels were explained by shifts in lifestyle and use of medications [26]. The comparable findings come from northern Sweden, where a mean total cholesterol level decreased in men by 9% and in women by 13% between 1986 and 2004 [27].

As expected, the percentage of persons with elevated fasting glucose increase substantially between the surveys in both genders. Similar statistics were demonstrated by other authors, including the studies presenting the growing burden of diabetes in last decades. The systemic review presented by Ogurtsova et al (2017) revealed that diabetes prevalence, deaths attributable to diabetes, and health expenditure due to diabetes continue to rise across the globe with important social, financial and health system implications [28].

As far as the blood pressure level is concerned, the present study showed a substantial rise in the percentage of subjects with elevated BP, especially among women. The similar results were showed by Niklas et al. (2018), who demonstrated that the prevalence of hypertension in Poland increased by 12% in the same period [29]. Contrary to Polish statistics, in Korea the prevalence of hypertension decreased over the 16-year period [30]. However, Gupta et al. (2017) showed an increasing trend in the hypertension statistics in 25-year observation of Indian adults. These findings are, to some extent, consistent with our results [31].

According to our results, the prevalence of metabolic syndrome increased significantly in Polish adults between the surveys. This finding was rather expected as the level of physical activity importantly decreased and most of metabolic characteristics worsen in the observation period. Szostak-Węgierek et al. (2017) also showed that excessive weight, especially central obesity, and other metabolic abnormalities are common in women of childbearing age in our country [32]. Such unfavourable trends are similar in several other countries. However, Shin et al. (2018) demonstrated that MetS, although still prevalent, remained rather stable among Americans in the years 2007-2014 [33].

However, some favorable trends in health behaviours of Polish adults should be acknowledged. Over a decade, we observed a significant decrease of current smokers and an increase of former smokers in both genders. The similar trends were presented by Kaleta et al in the analysis of Global Adult Tobacco Survey (GATS) for years 2009-2010 [34]. Although according to the world's resources, the global percentage of smokers is declining, it remains one of the most important issues of health promotion in Poland. As in other countries there are some sociodemographic groups that require special attention in the successful process of tobacco. Quitting smoking remains still difficult in particular groups, mainly less educated with lower socioeconomic status [35].

The potential limitation of the study was using self-reports to obtain information on smoking and PA patterns which can be responsible for some inaccurate data. Another important issue concerns a decrease in response rates in the second edition the WOBASZ project. However, several strengths of this study should be highlighted. Both WOBASZ surveys comprised nationally representative data based on a large number of participants. Importantly, both studies adopted consistent methodology to ensure comparable data on trends in analyzed variables.

In conclusion, it is important to highlight that most of analyzed behaviors and clinical characteristics have worsened in recent years in Poland. One of the most spectacular changes is the decline in physical activity level and the increase of obesity, glucose metabolism and other metabolic disorders. Due to still high premature mortality in Poland, caused mainly by cardiovascular diseases, it seems crucial to elaborate more effective strategies focused on active lifestyle promotions as well as prevention of metabolic syndrome.

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