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Social Diversification of Overweight and Obesity in Adults in Poland

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ABSTRACT

Overweight and obesity are connected with environmental factors to a greater degree than with genetic and psychological factors, because in their aetiology the focus is mostly on two factors, i.e. inappropriate diet and a sedentary lifestyle. This is an increasingly widespread phenomenon that harms the health and quality of life in adults, and also contributes to a decrease in their efficiency at work. The study aimed to evaluate the social diversification of overweight and obesity in adults living in different social environments in Swietokrzyskie region of Poland. The study was based on a questionnaire and observations, and encompassed 517 women and 515 men aged between 20 and 59 years. The questionnaire included questions about the characteristics of the social and family environment; while the observation involved anthropometric measurements of the basic somatic traits that were used to calculate the Body Mass Index (BMI), Waist-to-Hip Ratio (WHR) and Waist-to-Height Ratio (WHtR), which in turn were used to evaluate the occurrence of overweight and obesity. The incidence of overweight and obese adults showed a clear increase with age and displayed considerable social diversification, especially in the case of the women, among whom a better financial situation and a higher level of education correlated with a more slender body shape and a smaller increase in the incidence of overweight and obesity. The increase in the number of overweight and obese adult persons who lived in the different social environments in Poland was only slightly smaller than the increase in other European countries. Overall, the social diversification of overweight and obesity in adult persons indicates that Polish women are more health-aware than men.

Key words: *aged 20–60, BMI, WHR, WHtR, place of residence, eeconomic situation, financial situation, education*

Introduction

The continuously increasing incidence of overweight and obesity and their strict correlation with many disorders, especially cardiovascular disorders, indicates that this is a serious health and social issue in modern societies, caused mostly by cultural and environmental factors[1–3]. A high-energy diet, large portions, low levels of physical activity and a sedentary lifestyle are the main risk factors for the occurrence of obesity, which is in turn a cause of many serious illnesses that limit a person's ability to work and may lead to premature death[3–7]. Furthermore, the costs of health care among overweight and obese persons are almost 45 % higher than among persons with the correct weight[8].

The occurrence of overweight and obese persons is a complex phenomenon, because it is determined by many genetic, metabolic and environmental factors. According to experts from the World Health Organisation (WHO), there are two main factors that are responsible for this worldwide epidemic, i.e. a sedentary lifestyle and an inappropriate diet, especially the consumption of high-fat and high-calorie foods, which is connected with changes taking place in the social patterns of human health-related behaviours[9]. However, formulating effective strategic plans to counteract the epidemic of obesity is impossible without a good knowledge of both its determinants and its socio-economic diversification. These determinants include: age, sex, education, the economic situation and the social environment, i.e. the place of residence[10,11].

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Population studies have primarily used the Body Mass Index (BMI) to evaluate incidences of overweight and obesity, despite the fact that many authors have questioned the application of this index to assess the amount of fat tissue[12,13]. Therefore, such studies only address simple obesity, which results from an excessive body mass. It seems, however, that the main purpose of using the BMI is to correlate the results obtained among larger populations with the incidence of various diseases of affluence[14] and with various lifestyle elements, especially those involving physical activity.

A good complement to the BMI measurements are the Waist-to-Hip Ratio (WHR) (i.e. waist circumference / hip circumference), and the Waist-to-Height Ratio (WHtR) (i.e. waist circumference / body height), which are measurements related to various, relatively constant risks of complications due to obesity and can be used to determine the type of obesity. According to the WHO[15] WHR was classified among men as normal weight (<0.90), overweight (0.90–0.99) and obese (≥1). The corresponding cut-off values for women were <0.80, 0.80–0.84 and ≥0.85 respectively. The correct value of the WHtR is lower or equal to 0.5, and values that are higher than 0.5 indicate abdominal obesity[16].

The 'apple-shaped' type obesity concerns mostly the abdominal area and is related to a higher risk of accompanying diseases such as hypertension, Type 2 diabetes or ischaemic heart disease[17]. This type of obesity occurs mostly in men, although women undergoing menopause are also at risk[18,19]. The increase in BMI in postmenopausal women is associated with adverse influence on the bones, intensifies the negative phenomena in the body, causing the occurrence of many diseases, including osteoporosis and osteopenia[20]. The 'pear-shaped' obesity, which occurs mostly in women, causes an excess of fat tissue to accumulate in the area of the buttocks and hips, while the upper parts of the body usually remain small.

In the European population, overweight and obesity are responsible for 80% of the cases of Type 2 diabetes, 35% of the cases of ischaemic heart disease and 55% of the cases of hypertension among adults. Moreover, it has been calculated that 1 in 13 deaths in Europe is related to excessive body mass[21]. This is why, despite continuous progress in the treatment of obesity, it seems reasonable that the need for a prevention and response strategy is needed, especially on the level of entire populations[3].

The aim of this study was to evaluate the social diversification of overweight and obesity in adult persons living in the different social environments in Poland, with respect to factors such as: age, sex, place of residence, education level and economic situation.

Material and Methods

The study was conducted in different workplaces Swietokrzyskie region, which is situated in south-eastern Poland and it used a combination of nonprobability and random sampling to select the group of participants encompassing 517 women and 515 men aged between 20 and 59 years, who represented different stratifications of the society. The participants were further divided into four age groups: 20–29 years (N=301), 30–39 years (N=239), 40–49 years (N=255) and 50–59 years (N=237). The mean ages in the different age groups were: 22.6 years, 34.9 years, 44.8 years and 54.4 years, respectively.

In terms of education, the study distinguished between those persons whose highest level of completed education was primary education, basic vocational education, secondary education, associate degree and higher education. The most numerous group were those persons with a secondary education (37.8%), followed by persons with a primary and basic vocational education (29.3%); 19.4% of the participants had finished higher education and 13.5% had an associate degree. The prevalence did not differ significantly from those observed for the Polish population[22].

In terms of urbanisation, the study distinguished between three social environments as the participants' place of permanent residence, namely: a village, a small city and a large city (with a population of over 100,000). The persons living in villages constituted 42.3% of the participants, while 32.7% of the studied adults lived in small cities and 25.0% lived in large cities, which to a large extent, corresponds to the overall structure of the Polish population[22]. The study also distinguished between three categories of economic situation: 19.6% of the participants declared that they had a good economic situation, 60.4% declared an average economic situation, and 20.0% declared a bad economic situation. Therefore, there was a clear predominance of persons declaring an average financial situation, which again indicates that this study is representative. The investigated sample represented all categories of urbanization and was varied in terms of socio-economic status and the incidence of the represented categories did not differ significantly from the rate observed for the Polish population[22].

The main research method involved observations, which encompassed anthropometric measurements of the basic somatic traits using the Martin method. The body height was measured with an anthropometer to an accuracy of 1 mm, body mass was measured with Seca mechanical scales to an accuracy of 100 g, and the waist and hip circumference was measured with a tape measure. The measurements of these traits were used to calculate the following:

- standard weight index (BMI), according to the following formula[15]: body mass [kg] / body height [m^2]; BMI was classified as underweight (below 18.5); normal weight (18.5–24.9); overweight (25.0–29.9) and obesity (≥30.0)WHR: waist circumference [cm] / hip circumference [cm] (WHO, 2008), which describes the distribution of fat tissue; WHR was classified among men as normal weight (<0.90), overweight (0.90–0.99) and obese (≥1). The corresponding cut-off values for women were <0.80, 0.80–0.84 and ≥0.85 respectively;
- WHtR: waist circumference [cm] / body height [cm], where this ratio is the second most important indicator of the distribution pattern of fat tissue[16].

Statistical analyses

Regression analysis was used to describe the changes in men's and women's BMI, WHR and WHtR according to their calendar age. Correlations between continuous variables were evaluated using the analysis of variance (ANOVA), in which the significance of differences between the variances was assessed with Snedecor's *F*-test. The analysis of variance was extended by *a posteriori* tests in order to compare the respective groups. The analysis of differences among BMI, WHR and WHtR regarding groups with place of residence, level of education and economic situation were carried out using multiple regression analysis. Correlations between the single categorised variables were evaluated using Spearman's rank correlation coefficient. All of the calculations were performed with STATISTICA 12.0 software, and the level of significance was assumed at $p \leq 0.05$.

Results

The results of regression analysis revealed that BMI, WHR and WHtR values increased with age. (Fig.1 and Fig. 2, Table 1). The highest mean values of the BMI were observed in the oldest group of women, while the lowest mean values were observed in the youngest group of women (Table 2). The difference between the mean values of the BMI in the abovementioned groups was 6.17 a.u. Indeed, using all the parameters analysed in this study, i.e. the BMI, WHR and WHtR, showed significant differences between the groups of the women (Table 2), where age was a very significant differentiating factor. Additionally, we stated that (regarding the results of the Tukey's HSD test) the differences between all categories were statistically relevant.

TABLE 1

AGE-RELATED CHANGES IN BMI, WHR, AND WHtR – RESULTS OF REGRESSION ANALYSIS

Trait	N	R	R^2	B	SE	t	p
			Men				
BMI	515	0.34	0.11	0.087	0.01	8.11	0.001
WHR	515	0.54	0.29	0.037	0.01	14.41	0.001
WHtR	515	0.39	0.16	0.002	0.01	9.87	0.001
			Women				
BMI	517	0.56	0.31	0.18	0.01	15.37	0.001
WHR	517	0.61	0.37	0.004	0.01	17.25	0.001
WHtR	517	0.61	0.37	0.004	0.01	17.22	0.001

Body Mass Index (BMI), Waist-to-Hip Ratio (WHR), Waist-to-Height Ratio (WHtR)

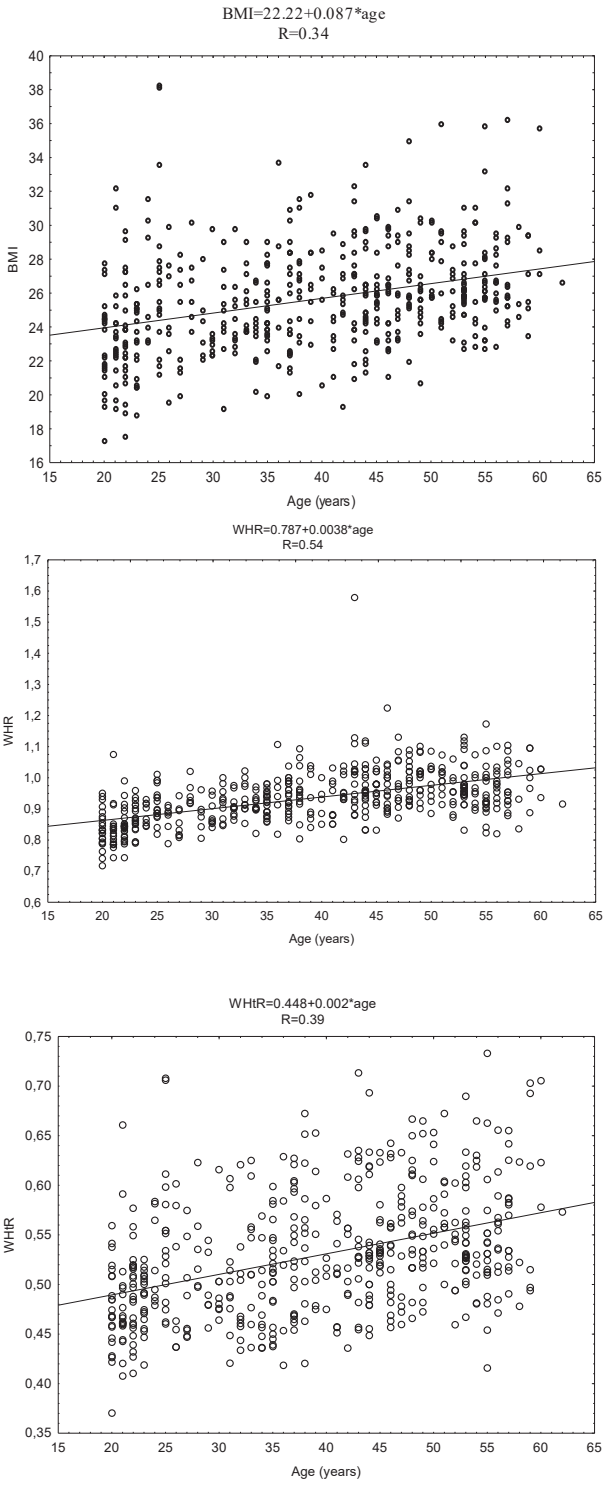

Fig. 1 Changes of women's BMI, WHR and WHtR with calendar age

Statistically significant differences in the values for the waist circumference and hip circumference correlated with a considerable diversification of the WHR between the studied age groups of women. The lowest mean waist circumference to hip circumference ratio was observed in the youngest group of the women, while the highest value of this ratio was noted in the oldest group of the women, which indicates that the tendency toward the central (vis-

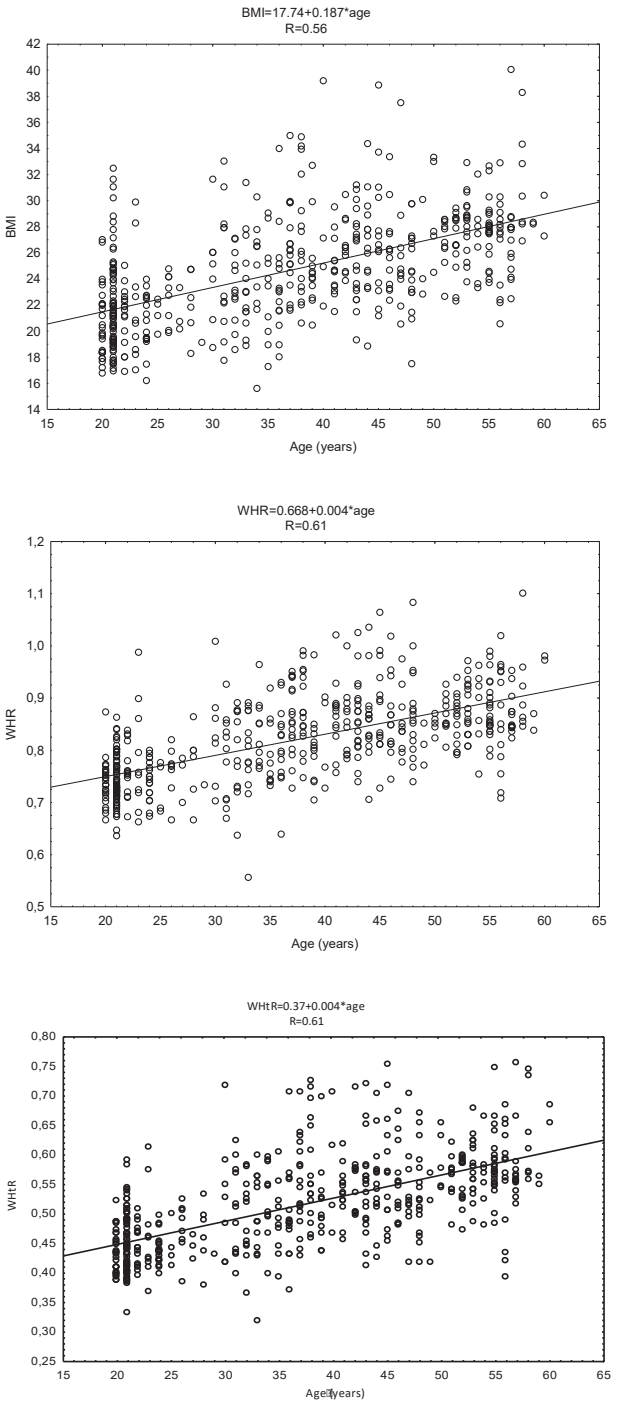

Fig. 2 Changes of men's BMI, WHR and WHtR with calendar age.

ceral) type of obesity increases with age (Table 2). Abdominal obesity occurred in 57.8% of the studied women, while 42.2% showed a peripheral fat distribution, and the mean value of the WHR increased considerably with age. Furthermore, the lowest mean WHtR, which indicates a more peripheral type of fat distribution, was noted in the youngest age group of women; whereas the highest mean value of this ratio was observed in the oldest group of women (Table 2). Additionally, we stated that (regarding the results of the Tukey's HSD test) the differences between all categories were statistically relevant.

The evaluation of the BMI values according to the WHO classification indicated that almost 50% of the women had the correct body mass, more than one third were overweight and 9.3% of were obese. A relatively large number of the women aged between 20 and 29 years were underweight (15.8%); but at the same time, a vast majority (73.3%) had the correct standard body mass. On the other hand, only 18.4% of the women in the 50–59 years age group showed the correct body mass, and the incidences of overweight and obesity clearly increased with age.

Evaluation of the BMI values showed that 42.2% of the studied men had the correct body mass, 50.2% were overweight and 7.2% were obese. The largest percentage of the men with the correct body mass was recorded in the youngest age group (61.8%), while the lowest percentage was noted in the oldest group (19.7%). The number of overweight individuals clearly increased with age, ranging from 30.9% in the youngest group (20–29 years), through 43.6% in the 30–39 years group and 57.6% among the 40–49-year-olds, to 69.7% in the 50–59 years age group. Furthermore, in the study it was observed that the highest percentage of obese men (10.3%) was recorded in the oldest group.

The highest mean values of the BMI, WHR and WHtR were all observed in the oldest group of the men (50–59 years), and the lowest values were observed in the youngest group (20–29 years). The differences between the mean values of these parameters were fairly considerable; therefore, age was a very significant differentiating factor for the values (Table 3). Tukey's HSD test showed the statistically significant differences between all categories of age.

The lowest mean waist circumference to hip circumference ratio was observed in the youngest group of the women, while the highest one was noted in the oldest group of the women, which indicates that the central (visceral) type of obesity increases with age (Table 2). Abdominal obesity occurred in 57.8% of the women, while 42.2% showed a peripheral fat distribution and the mean value of the WHR increased significantly with age (Table 2). Furthermore, the lowest mean WHtR, which indicates a more peripheral type of fat distribution, was noted in the youngest age group of women; whereas the highest mean WHtR was observed in the oldest group (Table 2).

Similarly, the lowest waist circumference to hip circumference ratio was a characteristic of the youngest group of the men, while the highest ratios were recorded in the groups of 40–49-year-old and 50–59-year-old men. The differences between the mean values were statistically significant, and age was a very significant differentiating factor for the values of the WHR (Table 3). The qualitative evaluation of this indicator showed that abdominal obesity occurred in 22.0% of all the studied men, while 78.0% of the male participants displayed a correct distribution of fat, i.e. a peripheral distribution.

TABLE 2

ANALYSIS OF THE VARIANCE OF MEAN VALUES ($\bar{x}$) OF THE BMI, WHR AND WHtR IN THE ADULT WOMEN ACCORDING TO AGE

Index	Age group (years)					Analysis of variance (ANOVA)			
	♀20–29 N=165	♀30–39 N=122	♀40–49 N=116	♀50–59 N=114	♀20–59 N=517	f_1	f_2	F	p
BMI [a.u.]	21.60	24.76	26.08	27.77	24.71	3	513	79.90	**0.001**
WHR [a.u.]	0.75	0.82	0.86	0.88	0.82	3	513	102.64	**0.001**
WHtR [a.u.]	0.45	0.52	0.55	0.58	0.52	3	513	101.09	**0.001**

Statistically significant correlations are given in bold.

TABLE 3

ANALYSIS OF VARIANCE OF THE MEAN VALUES ($\bar{x}$) OF THE BMI, WHR AND WHtR IN THE ADULT MEN ACCORDING TO AGE

Index	Age group (years)					Analysis of variance (ANOVA)			
	♂20–29 N=136	♂30–39 N=117	♂40–49 N=139	♂50–59 N=123	♂20–59 N=515	f_1	f_2	F	*p*
BMI [a.u.]	24.35	25.27	26.03	26.92	26.92	3	511	17.951	**0.001**
WHR [a.u.]	0.88	0.93	0.97	0.97	0.94	3	511	35.382	**0.001**
WHtR [a.u.]	0.50	0.52	0.54	0.56	0.53	3	511	27.191	0.001

Statistically significant correlations are given in bold.

The lowest mean waist circumference to height ratio in the men, which indicates a more peripheral type of fat tissue distribution, was noted in the youngest group; whereas the highest mean value was observed in the oldest group (0.56). This indicates again that the central (visceral) type of obesity increases with age. The differences between the mean values were statistically significant, and age was a very significant differentiating factor for the values of the WHtR in the studied men (Table 3).

In order to determine the impact of socioeconomic variables on BMI, WHR and WHtR multiple regression analysis was used. The models proved to be statistically significant (Table 4), and all predictors explained in women 33 (F=21.65; p<0.001), 31 (F=17.73; p<0.001) and 31 (F=18.85; p<0.001) percent of the variables: BMI WHR and WHtR respectively. For men all predictors explained 28 (F=15.09; p<0.001), 30 (F=17.32; p<0.001) and 29 (15.98; p<0.001) percent respectively. The results of the multiple regression analysis indicated that, except for determinant regarding the place of residence in the men, the occurrences of overweight and obesity showed a significant social diversification. At the same time, this diversification was considerably greater among the women than among the men, especially with respect to the education and economic situation determinants (Table 4).

The results of the Spearman's rank correlation coefficient also indicated stronger social determinants regarding occurrences of overweight and obesity in the women than in the men (Table 5). At the same time, a higher level of education and a better economic situation correlated among the women with a lower increase in the incidence of being overweight and obese. On the other hand, in the men, the level of education either did not show any correlation with incidences of overweight and obesity, or, as was also found in the case of the economic situation, it showed an inverse correlation because a better economic

TABLE 4

SOCIO-ECONOMIC FACTORS ASSOCIATED WITH BMI, WHR AND WHtR –RESULTS OF MULTIPLE REGRESSION ANALYSIS

Factor	Variable	Women			Men		
		F	f1	p	F	f1	p
Place of residence	BMI [kg/m2]	52.928	1	0.001	10.564	1	0.001
	WHR [a.u.]	47.870	1	0.001	16.600	1	0.001
	WHtR [a.u.]	9.937	1	0.002	41.446	1	0.001
Education	BMI [kg/m2]	6.513	1	0.011	21.327	1	0.001
	WHR [a.u.]	11.495	1	0.001	21.233	1	0.001
	WHtR [a.u.]	25.445	1	0.001	11.671	1	0.001
Financial situation	BMI [kg/m2]	6.099	1	0.013	9.010	1	0.003
	WHR [a.u.]	12.547	1	0.001	6.010	1	0.050
	WHtR [a.u.]	12.768	1	0.001	5.610	1	0.021

TABLE 5

RESULTS OF THE SPEARMAN'S RANK CORRELATION COEFFICIENT CONCERNING THE CORRELATIONS OF BEING OVERWEIGHT AND OBESE IN WOMEN AND MEN, BASED ON BMI, WHR AND WHTR BY VARIOUS SOCIO-ECONOMIC FACTORS

Factor	Variable	Women			Men		
		R	t	p	R	t	p
Place of residence	BMI [kg/m^2]	0.043	0.977	0.329	0.116	2.646	0.008
	WHR [a.u.]	0.099	2.253	0.025	0.042	0.941	0.347
	WHtR [a.u.]	0.066	1.510	0.131	0.099	2.247	0.025
Education	BMI [kg/m^2]	–0.240	5.609	0.001	0.051	1.148	0.252
	WHR [a.u.]	–0.213	4.960	0.001	0.007	0.168	0.867
	WHtR [a.u.]	–0.263	6.195	0.001	0.083	1.879	0.061
Economic situation	BMI [kg/m^2]	–0.265	6.218	0.001	0.080	1.816	0.070
	WHR [a.u.]	–0.174	4.022	0.001	0.089	2.037	0.042
	WHtR [a.u.]	–0.171	3.939	0.001	0.077	1.758	0.080

situation was accompanied by an abdominal ('apple-shaped') obesity (Table 5). A higher degree of urbanisation in the social environment (i.e. the place of permanent residence) also correlated with a higher incidence of being overweight and obese in the men.

Discussion and Conclusion

Overweight and obesity are considered to be caused by genetic, psychological and environmental factors[23–25]. Simple (secondary) obesity, which results from a positive energy balance, constitutes around 90% of all obesity cases; whereas primary obesity, which is genetically determined, constitutes about 10% of cases[26]. Furthermore, when speaking about social diversification in the incidence of overweight and obesity, the influence of many different environmental factors and their aggregative, i.e. group effect should be remembered. This is related to the fact that the various elements of a lifestyle, such as a higher level of physical activity and a more rational diet, are generally connected with a higher level of education[27,28].

In the present study, just as in the studies by other authors[18, 26–29], the social diversification of overweight and obesity in adult persons was confirmed. However, in women, a higher level of education correlated with a more slender and linear body shape, while in men such a correlation was not observed. A better economic situation also correlated in the women with more desirable health traits regarding their body build and a smaller increase in the incidence of being overweight and obese, which indicates that women are more health-aware than their male counterparts. On the other hand, a lower level of awareness and a less healthy lifestyle among men often leads to many serious health problems, which in turn causes an excessive mortality rate among men[30–32]. Lower educational level is connected with physical inactivity and sedentary behaviour[33]. Both are positively associated with BMI[34]. Sedentary behaviour such as watching television and time spent on reading provide to unhealthful dietary behaviours, such as increased consumption of alcohol and soft drinks (e.g. coca cola), fried foods, sweets and a lot of snacks which rise BMI, WHR and WC[35]. Education is a very important factor that affects not only awareness of the health consequences in overweight and obese people, but also changes in lifestyle. Despite a wide campaign informing that obesity is a disease of the 21st century, there are still too little educational programs informing about the health consequences of overweight and obese people (e.g. diabetes type 2, heart disease, hypertension, and cancer). For this reason, the expenditure on educating societies in the field of preventing excessive body weight should be increased. Research of Hacihasanoğlu and Gözüm[36] have shown that education combined with teaching a healthy lifestyle is an effective tool to prevent overweight and obesity. Researchers demonstrated that six-month education on maintaining a healthy lifestyle showed improvement after educational sessions, not only in terms of self-efficacy in adherence to treatment recommendations, but also in the keeping maintaining a healthy lifestyle by increasing physical activity, following a proper diet, and consequently, the reduction in the incidence of overweight and obesity in the studied group.

As has been mentioned, an excessive body mass is a risk factor for the occurrence of what is referred to as diseases of affluence, which include hypertension, ischaemic heart disease, Type 2 diabetes and many other illnesses. The reference values for the BMI in adult persons should fall within the range of 18.5–24.9 kg/m^2 [9]; whereas a BMI between 25 and 29.9 indicates an overweight person, and a BMI over 30 indicates obesity. According to a study of the Polish population performed by Szponar et al.[17], 74% of Polish women have the correct body mass, 11.3% are overweight and 3.3% are obese. The present research indicates that there has been a considerable increase in the percentage of the men and the women characterised by overweight and obesity, and also confirms that incidences of overweight and obesity occur more frequently in men than in women[3, 25, 28].

Over the past four decades, mean BMI and obesity in children, adolescents and adults have increased in most regions and countries. Despite this rise, more people, especially girls and young women, are moderately or severely underweight[37], Apart from obesity, the percentage of young underweight women recorded in the study was alarmingly high (15.8%). Research conducted by the National Food and Nutrition Institute in Warsaw[17] revealed that 11% of Polish women aged between 19 and 29 years have an insufficient body mass (BMI < 18.5 kg/m^2). It seems that the causes of this should be looked for in the fact that the mass media promotes the model of a slender woman. As far as the effect of the various somatic components on health is considered, researchers indicate that there are not only the threats resulting from an excessive body mass, but also (particularly for young women), threats to health resulting from an insufficient body mass. These threats involve, *inter alia*, the risk of an electrolyte fluid imbalance, osteoporosis, decrease of bone mass, tendency to suffer fractures, muscular atrophy, cardiac arrhythmia, and even sudden death[29,38]. Furthermore, it has been emphasised that a BMI under 18.5 or even 17 kg/m^2 has a negative effect on fertility and a negative impact on the reproductive abilities of women[39–41].

In the present study, the interpretation of the BMI was complemented with the distribution of fat tissue (the WHR and WHtR). Both of those parameters clearly increased with age; furthermore, considerable differences in the abdominal obesity (visceral) between the women (57.7%) and the men were observed (22.0%). Literature suggests that anthropometric measures of abdominal adiposity such as waist circumference (WC), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR) are strongly associated with risk of type 2 diabetes even more than BMI[42,43]. It should be emphasised that the effect of the distribution of fat tissue on different health indicators is not only related to the incidences of diseases and the death rate, but is also strongly connected with both the objective and the subjective (related to a lowered self-evaluation of health and the quality of life) health indicators. All the more so, the quality of life (QoL) is strongly related to overweight and obesity and depends on many different individual and social factors[44].

Due to the significance of the problem of overweight and obesity in adult persons from the perspective of public health (medical, psychological and economic consequences), as well as the socio-economic transformations in Poland that were initiated in the 1980s, which are still changing the economic situation, lifestyles and other conditions among various sectors of society and professional groups, the tendency for changes in the incidence and the socio-economic diversification of overweight and obesity in adult persons should continue to be monitored in detail.

The percentages of obese adult Polish women and men are only slightly lower than the values that have been observed in other European countries. The percentage of persons with overweight and obesity also increases with age. Overweight and obesity are observed slightly more frequently in men than in women, which is mainly related to the unfavourable changes occurring in modern civilisation and connected with the poor dietary habits of the majority of Poles, as well as with a decrease in physical activity which has increased the incidence of overweight and obesity adults. Furthermore, overweight and obese adult persons in Poland show a considerable social diversification. It seems that the financial situation and the level of education (the latter of which is an awareness factor that enables decision-making) play an important role in this respect. This is why a there is a greater social diversification of overweight and obesity, visible in adult women, which indicates that their awareness of the importance of maintaining good health is higher than in men.

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SOCIJALNA DIVERSIFIKACIJA PREKOMJERNE TEŽINE I PRETILOSTI KOD ODRASLIH OSOBA U POLJSKOJ

S A Ž E T A K

Prekomjerna težina i pretilost povezani su više s okolišnim čimbenicima nego s genetskim i psihološkim, jer su u njihovoj etiologiji najvažnija dva čimbenika, neprimjerena prehrana i sjedeći način života. Ovo je sve raširenija pojava koja šteti zdravlju i kvaliteti života odraslih, a također pridonosi smanjenju njihove učinkovitosti u radu. Studija je imala za cilj procijeniti socijalnu diversifikaciju prekomjerne težine i pretilosti kod odraslih osoba koje žive u različitim socijalnim okruženjima u regiji Swietokrzyskie u Poljskoj. Studija se temeljila na upitniku i opažanjima te je obuhvatila 517 žena i 515 muškaraca u dobi od 20 do 59 godina. Upitnik je uključivao pitanja o karakteristikama socijalnog i obiteljskog okruženja, dok je promatranje uključivalo antropometrijska mjerenja osnovnih somatskih obilježja koja su korištena za izračunavanje indeksa tjelesne mase (BMI), omjera između struka i kuka (WHR) i omjera između struka i visine (WHtR), a koji su potom korišteni za procijenu prekomjerne težine i pretilosti. Učestalost prekomjerne tjelesne težine i pretilih odraslih osoba pokazala je jasan porast s godinama starosti i znatnu socijalnu diversifikaciju, posebno u žena, među kojima je zapaženo da su bolja financijska situacija i viši stupanj obrazovanja povezani s vitkijim oblikom tijela i manjim porastom učestalosti prekomjerne težine i pretilosti. Porast broja odraslih osoba s prekomjernom težinom i pretilih osoba koje žive u različitim socijalnim okruženjima u Poljskoj tek je neznatno manji od porasta u drugim europskim zemljama. Općenito, socijalna diversifikacija prekomjerne težine i pretilosti kod odraslih osoba ukazuje na to da su poljske žene zdravstveno osviještenije od muškaraca.