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Incidence of overweight and obesity in women aged 20–59 years from the Świętokrzyskie Region

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A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background: The occurrence of overweight and obesity is a complex phenomenon, determined by genetic, metabolic and environmental factors. This is why, despite the continuous progress in treating obesity, it seems justified to indicate its diversification and the need for prevention and for developing a strategy of action at the level of entire populations. The aim of the study was to evaluate the incidence of overweight and obesity in women aged 20–59 years according to selected socio-economic factors.

Material and methods: The study used a combination of nonprobability and random sampling and it encompassed 547 women from the Świętokrzyskie Region. The research methods included an interview (i.e. categorised interview) and observations. In the interview, the respondents were asked about their social environment, in particular, their education level, place of residence and financial situation, while the observations encompassed measurements of the basic somatic traits that allowed for calculating the BMI, WHR and WHtR.

Results: The BMI, WHR and WHtR of the studied women displayed significant intergroup diversification, where age was a strongly diversifying factor.

Conclusions: Higher education level and better financial situation of woman are correlated with a lower incidence of overweight and obesity.

Key words: overweight and obesity, women aged 20-59, socioeconomic factors, health, Świętokrzyskie Province.

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INTRODUCTION

Obesity is a problem of the utmost social importance that includes economic concerns. It has even been stated as one of the primary dangers to health faced by the modern societies of the developed world [1]. Obesity develops due to a long-term positive energy balance, the occurrence of which may be facilitated by genetic, environmental and other factors. It is believed that the genetic factors play a significant role in about 25–40% of obesity cases, because 7% of the children of slender parents will develop obesity, whereas if both parents are obese, as many as 80% of the children will develop obesity. Genetic factors can determine the regulation of the appetite, preferences for products rich in fat and sugar, the ability to oxidise fat and carbohydrates, etc. [2].

It has been proven that excessive adiposity, especially visceral adiposity, has severely negative consequences for the health of an organism [1]. The increase in the percentage of obese people is very worrying due to the observed correlation between overweight conditions, in particular obesity, and a higher risk of chronic diseases, primarily circulatory system disorders, and premature death [3]. Obesity is an independent, basic risk factor for ischaemic heart disease and hypertension. Among women, circulatory system disorders constitute 50% of the causes of all deaths.

An important role in the occurrence of obesity is played by environmental factors, because obesity is most often connected with excessive consumption of highly processed and high-calorie foods. Over the last several decades, the size of the consumed portions has increased, and snacks, which are usually high-calorie food, have become more common. Also, the consumption of fibre has decreased, while the intake of easily assimilated carbohydrates and fat has increased. This is why a high-energy diet, a low level of physical activity and a sedentary lifestyle are listed among the main risk factors for the occurrence of obesity, which is a cause of many serious diseases that may lead to premature death [4,5].

Thus, the occurrence of overweight and obesity is a complex phenomenon that is determined by many factors: genetic, metabolic and environmental. According to the World Health Organisation (WHO) experts, this worldwide epidemic has two main causes: a sedentary lifestyle and an inappropriate diet, especially involving the consumption of high-fat and high-calorie foods, which is related to changes taking place in the social health-related patterns of behaviour [6]. Furthermore, controlling the standard weight as the main measure of health (the morphological component), which constitutes an important element of a holistic model of life, is essential in planning and carrying out prophylactic training [7].

Population studies have mostly used the Body Mass Index (BMI) to evaluate overweight and obesity, even though many authors have questioned its viability for assessment of the fat tissue amounts [8, 9], as we are dealing here only with simple obesity resulting from an excessive body mass. However, it seems that this index has been used primarily for associating the measurements obtained among larger groups with the incidence of different diseases of affluence [9], and with various lifestyle elements, especially the level of physical activity.

Good complements to the BMI 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 both correlated with the different and fairly constant risks of complications caused by obesity, and are also used to determine the type of obesity: android-type obesity (abdominal obesity, also referred to as 'apple-shaped' obesity); and gynaecoid-type obesity (buttock and thigh obesity, also referred to as 'pear-shaped' obesity) [10]. 'Apple-shaped' obesity affects the abdominal area and is connected with a higher risk of the accompanying diseases such as hypertension, Type 2 diabetes and ischaemic heart disease [11]. This type of obesity mostly develops in men, although menopausal women are also at risk. In 'pear-shaped' obesity, which mostly occurs in women, the excess fat tissue accumulates in the buttocks and hips, while the upper parts of the body usually remain small.

In the European population, overweight and obesity in adult persons accounts for 80% of the cases of Type 2 diabetes, 35% of the cases of ischaemic heart disease, and 55% of the cases of hypertension. It has also been calculated that 1 in 13 deaths in Europe is connected with an excessive body mass [12]. This is why, despite the continuous progress in treating obesity, it seems reasonable to indicate the need for prevention and to develop a strategy of action, especially at the level of entire populations [5].

The main aim of this study is to evaluate the incidence of overweight and obesity among adult women from the Świętokrzyskie Region according to socio-economic factors, such as their age, education level, place of residence and financial situation.

AIM OF THE RESEARCH

To evaluate the incidence of overweight and obesity in women aged 20–59 years according to selected socio-economic factors.

MATERIAL AND METHODS

The study encompassed 547 women representing different stratifications of the society, who were divided into four age groups: 20–29 (N = 165; 30.2%), 30–39 (N = 132; 24.1%), 40–49 (N = 126; 23.0%) and 50–59 (N = 124; 22.7%) years old. The study also distinguished between the following four groups in terms of the level of education: basic vocational education, secondary education, associate degree and higher education. The most numerous group of study participants consisted of women with secondary education (N = 219; 42.4%), followed by women with basic vocational education (N = 165; 30.2%), then those with higher education (N = 91; 17.6%) and an associate degree (N = 86; 10.8%). Within the urbanisation variable, the study distinguished between three social environments constituting the place of permanent residence of the studied women, i.e. a village (N = 257; 47.0%), a small city – from 20 to 50 thousand inhabitants (N = 158; 28.9%) and a big city – above 100 thousand inhabitants (N = 132; 24.1%). Furthermore, the following three categories of financial situation were assessed subjectively and distinguished: good (N = 106; 19.4%), average (N = 329; 60.2%) and bad (N = 112; 20.4%).

The research methodology involved an interview and observations, specifically consisting of a categorised interview where the participants were

anthropometric measurements of the basic somatic traits using the Martin technique. Body height was measured with an anthropometer to an accuracy of 1 mm, while the body mass was measured with Seca mechanical scales to an accuracy of 100 g, and the waist and the hip circumferences were measured with a tape measure to an accuracy of 1 cm. The measurements of these traits were used to calculate:

- Standard weight (BMI), according to the formula:
  body weight (kg) / body height (m^2) [10];

- Waist-to-Hip Ratio (WHR): waist circumference (cm) / hip circumference (cm) [10], which determines the distribution of the fat tissue – in women, a value of this ratio exceeding 0.8 indicates central (visceral) adiposity;

- Waist-to-Height Ratio (WHtR): waist circumference (cm) / body height (cm), which is the second most important indicator of the distribution of the fat tissue [13].

STATISTICAL ANALYSIS

Correlations between continuous variables were evaluated with the analysis of variance (ANOVA), in which the significance of differences was assessed with Snedecor's F-test. The correlations between the individual categorised variables were evaluated with the chi-squared test and Spearman's rank correlation coefficient. All of the calculations were performed with the STATISTICA 8.0 software, and the level of significance was assumed at $p \leq 0.05$.

RESULTS

The highest mean values of the BMI were noted in the oldest group of women, while the lowest values of this index were observed in the youngest group (Figure 1). The difference between the mean values of the BMI in these groups was 6.67 a.u. In all the analysed indexes, i.e. the BMI, WHR and the WHtR, significant differences were recorded between the groups of women (Table 2), with age being a strongly diversifying factor. The lowest mean Waist-to-Hip Ratio was observed in the youngest group and the highest one in the oldest group of participants, which indicates an increase in central (visceral) obesity with age (Table 1). Also, the mean value of the WHR increased considerably with age, indicating an increase in visceral adiposity. Likewise, the lowest mean Waist-to-Height Ratio (WHtR), indicating a more peripheral fat tissue distribution, was noted in the youngest age group of women, with the highest mean ratio in the oldest age group.

An evaluation of the BMI according to the classification by the WHO (Figure 1) showed that almost 50% of the studied women had the normal body mass, whereas more than 1/3 of them were overweight and 9.3% were obese. While a relatively high number of the women aged 20–29 were underweight (15.8%), a vast majority of the women from this age group had the normal standard weight (73.3%). On the other hand, in the 50–59-year-old group, only 18.4% of the participants had the normal body mass, and the percentage of overweight increased with age very significantly (Figure 1).

Table 1. Mean values of the BMI, WHR and WHtR in the studied women according to age

Index	Age groups (in years)					Analysis of variance (ANOVA)			
	20-29 N=165	30-39 N=132	40-49 N=126	50-59 N=124	Total 20-59 N = 547	*f*1	*f*2	F	*p*
	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$				
BMI [a.u.]	21.60	24.76	26.08	27.77	24.73	3	545	**79.909**	**0.0000**
WHR [a.u.]	0.75	0.82	0.86	0.88	0.81	3	545	**102.653**	**0.0000**
WHtR [a.u.]	0.45	0.52	0.55	0.58	0.53	3	545	**101.097**	**0.0000**

Statistically significant correlations are given in bold (in Tables 1–3).

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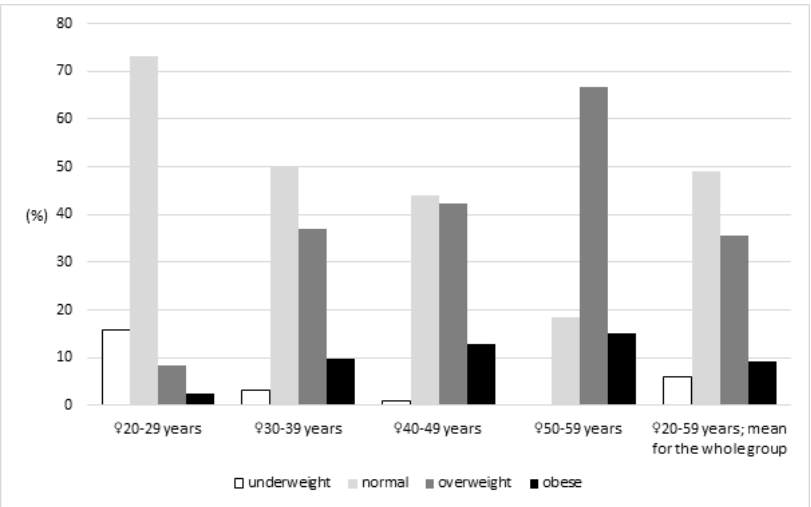

Fig. 1. Share of the BMI categories among the studied women (%)

The lowest mean Waist-to-Hip Ratio was observed in the youngest group of participants, while the highest one was recorded in the oldest group, which indicates an increase in central (visceral) obesity with age (Fig. 2). It can be observed that abdominal obesity occurred in 57.8% of all the studied women, while 42.2% displayed a peripheral fat tissue distribution, and the value of the WHR increased considerably with age. The lowest mean Waist-to-Height Ratio (WHtR), indicating a more peripheral fat tissue distribution, was also observed in the youngest group, and the highest mean value of this ratio was again noted in the oldest group (Fig. 3).

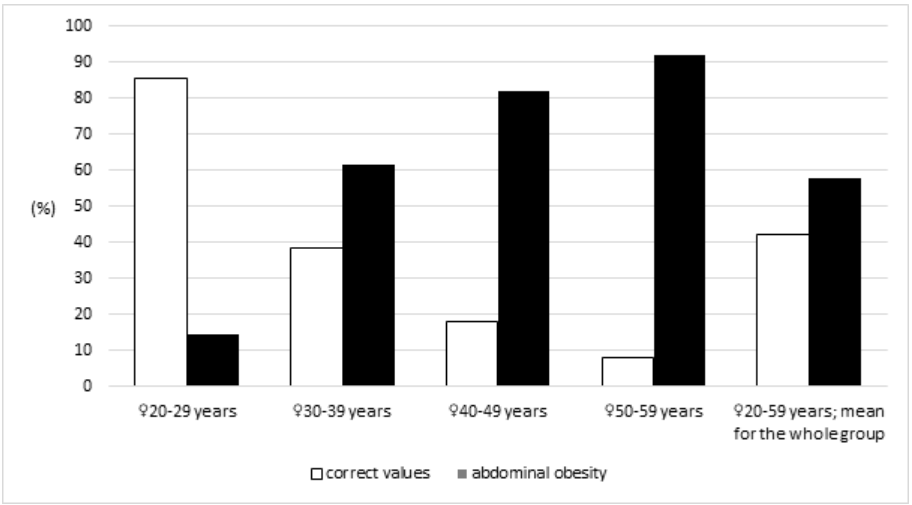

Fig. 2. Share of the WHR categories among the studied women (%)

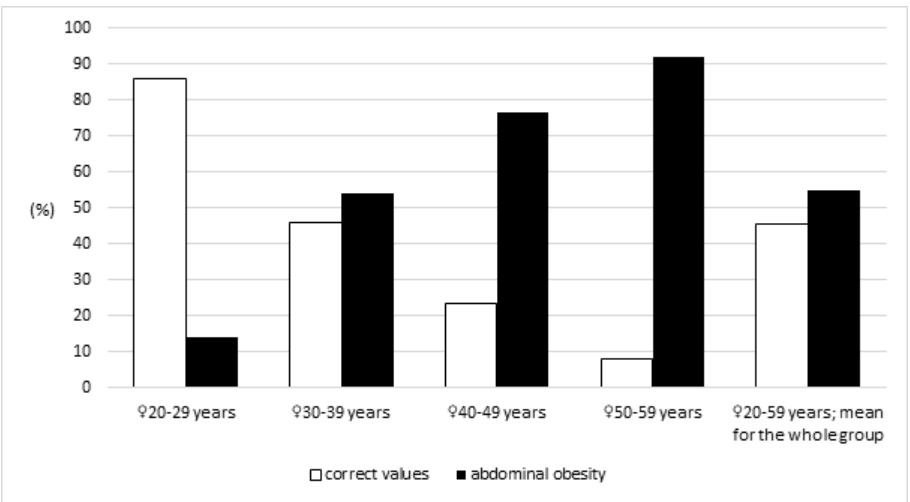

Fig. 3. Share of the WHtR categories among the studied women (%)

The results of the chi-squared test for independence and the Spearman's rank correlation coefficient indicated a strong diversification of the occurrence of overweight and obesity among the women, especially in terms of their level of education and financial situation. Importantly, a higher level of education and a better financial situation correlated with a lower incidence of overweight and obesity. On the other hand, it seems that the place of residence was a less significantly differentiating factor (Tables 2 and 3).

Table 2. Results of the chi-squared test for independence concerning the correlations between the occurrence of overweight and obesity in the studied women (determined with the BMI, WHR and WHtR) and various socio-economic factors

Factor	Trait	Results		
		χ^2	*f*1	*p*
Place of residence	BMI [kg/m²]	16.279	6	**0.0123**
	WHR [a.u.]	11.765	2	**0.0028**
	WHtR [a.u.]	11.521	2	**0.0032**
Education level	BMI [kg/m²]	64.435	9	**0.0000**
	WHR [a.u.]	55.594	3	**0.0000**
	WHtR [a.u.]	56.567	3	**0.0000**
Financial situation	BMI [kg/m²]	45.261	3	**0.0000**
	WHR [a.u.]	18.358	2	**0.0001**
	WHtR [a.u.]	18.849	2	**0.0000**

Table 3. Results of Spearman's rank correlation coefficient concerning the correlations between the occurrence of overweight and obesity in the studied women (determined with the BMI, WHR and WHtR) and various socio-economic factors.

Factor	Trait	Results		
		R	*t*	*p*
Place of residence	BMI [kg/m²]	0.04	0.977	0.3290
	WHR [a.u.]	0.10	2.253	**0.0246**
	WHtR [a.u.]	0.07	1.510	0.1313
Education level	BMI [kg/m²]	-0.24	5.609	**0.0000**
	WHR [a.u.]	-0.22	4.959	**0.0000**
	WHtR [a.u.]	-0.27	6.195	**0.0000**
Financial situation	BMI [kg/m²]	0.26	6.218	**0.0000**
	WHR [a.u.]	0.18	4.022	**0.0000**
	WHtR [a.u.]	0.17	3.940	**0.0000**

DISCUSSION

Obesity is considered to be caused by genetic, mental and environmental factors [14,15]. Simple obesity (secondary), which results from a positive energy balance, constitutes about 90% of all obesity cases; while primary obesity, which is determined genetically, constitutes only 10% of cases [16]. Moreover, when discussing social diversification in the occurrence of overweight and obesity, we should bear in mind the effects of many different environmental factors, including their aggregative (group) effects. For instance, a higher level of education is connected with other lifestyle elements, such as a higher level of physical activity and a more rational diet [17].

The present study, as well as studies by other authors [17,18], confirms the social diversification of the occurrence of overweight and obesity, because in women, a higher level of education correlated with a more slender, linear body shape. A better financial situation was also connected with more desirable, healthy traits of a body build and a lower incidence of overweight and obesity, which proves that the women in this studied group make informed health-related decisions. This is especially important since an excessive body mass, which is a risk factor for diseases of affluence, affects about 15% of Polish women, of which 11% are overweight and 3.5% are obese according to the nationwide studies conducted in Poland by Szponar et al. [11].

Another factor that is responsible for the occurrence of obesity is a women's diet during pregnancy and the duration of breastfeeding. As has been proven, undernourishment during pregnancy, especially a shortage of protein, iron and zinc, as well as an excess of trans isomers in the diet, contributes to metabolic disorders of the placenta and causes a tendency for abdominal obesity in the children of undernourished mothers. Furthermore, the children of undernourished mothers tend to show hypertension and an excessive excretion of insulin and cortisol [2].

In addition to obesity, the percentage of young underweight women (15.8%) is also worrying. Studies carried out by the Food and Nutrition Institute in Warsaw [11] revealed that 11% of Polish women aged between 19 and 29 years have too small body mass (BMI < 18.5 kg/m^2). It seems that the model of a slender woman being promoted by the mass media is one of the causes of this state of affairs.

In terms of the effects of various somatic components on health, researchers indicate that not only direct threats result from an excessive body mass, but also additional threats to health resulting from an insufficient body mass, particularly among young women. The threats in question involve, first and foremost, the risks of imbalances in electrolyte fluids, osteoporosis, a decrease in bone mass, a tendency for fractures, muscle atrophy, heart arrhythmia and even sudden death [18,19]. Moreover, it has been emphasised that a BMI exceeding 19.0 kg/m^2 has a negative effect on women's fertility and procreative capabilities [20, 21].

The interpretation of the BMI value has been supplemented by the qualitative analyses of the adiposity and fat tissue distribution (WHR and WHtR), which clearly increased with age. It should be stressed that the effect of the fat tissue distribution on various health indicators is not limited to the correlation with the occurrence of illnesses and the death rate. It is also closely connected to both objective health indicators, such as physical fitness and physical capacity [22], and subjective health indicators related to a lowered self-esteem and quality of life.

CONCLUSIONS

1. The percentages of obese adult women from the Świętokrzyskie Province are only slightly smaller than the values observed in other European countries.

2. The percentages of overweight and obese women clearly increase with age, which is primarily associated with the unfavourable changes occurring in modern civilisation, relating both to bad eating habits among women and a decrease in physical activity, which causes an increased incidence of overweight and obesity.

3. The occurrence of overweight and obesity among women shows significant social diversification, where a higher level of education and a better financial condition play important roles, and therefore the awareness factors affect the decision-making process.

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