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RESEARCH REPORT: OVERWEIGHT AND OBESITY AMONG THE ADULT POPULATION OF EASTERN SLOVAKIA

ABSTRACT: The aim of the study is to provide data on the incidence of overweight and obesity in the adult population of Eastern Slovakia. In particular, the study describes the assessment of obesity and evaluation of health status through the different anthropometric measurements. Body mass index, waist circumference and waist-to-hip ratio were measured using standardised methods. According to BMI, results confirmed a higher incidence of overweight and obesity in men (57.8%) than in women (33.4%). Waist-to-hip ratio provided lower incidence of obesity (9.4%) in men than in women (30.6%). Based on waist circumference (men ≥ 94 cm, women ≥ 80 cm), abdominal obesity was detected in 45.4% men and in 58.3% women. The study revealed that mean value of waist circumference in women (80.9 ± 10.6 cm) reaches the value associated with metabolic and cardiovascular disease risk. A statistical significant difference ($P < 0.05$) was found between men and women in mean values of body height, body weight, waist circumference, BMI and WHR in favour of men.

KEY WORDS: BMI – WC – WHR – Overweight – Obesity – Adult population

INTRODUCTION

The World Health Organization (WHO) has identified obesity as a global epidemic, which is one of the most serious chronic conditions of our time. The prevalence of overweight and obesity is rapidly increasing in developing as well as industrialised countries. Clinical definitions of obesity include the degree of excess body fat that places an individual at increased health risk. Increased body fat corresponds to increased health risks (NHLBI 1998, WHO 2000).

Obesity can be assessed in several ways. A general consensus exists for an indirect measure of body fatness called the weight for height index or body mass index (BMI) (AMA 2003). The method of measuring waist circumference is currently used in practice. It reveals a two times greater prevalence of individuals with suspected abdominal obesity than the BMI classification (Baráková 2009). In addition, abdominal obesity is measured by waist-to-hip ratio (WHR). Increased weight and waist circumference have been shown to be strongly associated with cardiovascular disease, diabetes, and hypertension in many populations (Foucan *et al.* 2002).

The objective of this study is to monitor the incidence of obesity in the adult population of Eastern Slovakia and to evaluate the health status through three key measures: body mass index (BMI), waist circumference (WC) and waist-to-hip ratio (WHR).

MATERIAL

The study group consisted of 136 randomly selected volunteers (64 men, 72 women), from the adult population of Eastern Slovakia. As the adult age is defined as 18 years of age and more, no other criteria in the selection of participants was used. Volunteers were invited to Presov University in Presov, where anthropometric measurements were performed by team of

researchers and Ph.D. students of Anthropology from the Department of Biology, University of Prešov.

METHODS

Measurements

Anthropometric measurements included body weight, body height, waist, and hip circumference. Body weight was measured using personal weighing scales, while the proband was in light clothing. Body height was measured with a regularly anthropometer, by Martin and Saller (1957): the proband stood against the wall, touching heels, buttocks and shoulder blades, the balls of the feet were slightly apart. The head was in equilibrium, i.e. Frankfurt plane (an imaginary line from lower border of the eye orbit to the auditory meatus). Waist circumference (WC) was measured midway between the lower rib margin and iliac crest, and hip circumference was measured at the level of the greater trochanters using a horizontal tape. Based on WHO criteria, WC values were classified into two risk categories (WC ≥ 94 and WC ≥ 102 cm in men; WC ≥ 80 and WC ≥ 88 cm in women). The classification of overweight and obesity, according to body mass index (BMI) was selected based on WHO to define individuals with underweight (BMI < 18.5 kg/m²), healthy weight (BMI 18.5–24.9 kg/m²), and overweight (BMI 25.0–29.9 kg/m²). Individuals with a BMI ≥ 30.0 kg/m² were classified as obese. BMI was calculated as weight, in kilograms (kg), divided by the square of height, in meters (m²). Waist-to-hip ratio (WHR) was used as reliable indicator of body fat distribution. WHR more than 0.85 in women and 1.00 in men has been shown to affect overall health. WHR was obtained by dividing waist circumference by hip circumference (WHO 2000).

Data analysis

The data obtained was evaluated by using the frequency tables, descriptive statistics and non-parametric tests using statistical software

PASW for Windows, version 17.0. The Mann-Whitney U test was used to compare differences between men and women. All data were presented as mean ± standard deviation (SD). Test results with P-value equal to or less than 0.05 were considered statistically significant.

RESULTS

The mean age of respondents was 34.4±12.5 years. The mean age of men was 32.3±13.0 years and of women 36.2±11.8 years. No significant difference between men and women in mean values of age was found. The statistical significant difference between men and women in mean values of body height, body weight, waist circumference, body mass index and waist-to-hip ratio was found in favour of men. Table 1 shows gender specific means ± standard deviation for anthropometric measurements.

Men were generally taller and had a greater weight than women. Mean levels of BMI, WC, HC, and WHR were higher among men than women. The distribution of BMI and WC values in men and women are displayed in Figure 1 and Figure 2. Waist circumference was used also as the best anthropometric predictor of visceral fat. The increased values of WC are associated with disease risk for type 2 diabetes, hypertension, and cardiovascular disease (AMA 2003). The mean value of waist circumference in women was 80.9±10.6 cm, which represents an increased risk described above.

The incidence of overweight and obesity varied greatly with gender, respective to the measurement used. Based on BMI, over 30% of women and more than half of men were overweight. 3.1% men and 2.8% women were in obese category. WC values were classified into 2 risk categories (WC≥94 and WC≥102 cm in men; WC≥80 and WC≥88 cm in women). WC showed a higher incidence of abdominal obesity in women (26.4%) than in men (18.8%). According to strict criteria for waist circumference (WC≥94 cm in men; WC≥80 cm in women), more than half respondents of whole investigated group (52.2%) had risk values for type 2 diabetes, hypertension, and cardiovascular disease. The distribution of visceral fat associated with health risk was also assessed by WHR. WHR provided the lowest incidence of obesity (9.4%) in men, than WC and BMI. WHR yielded the similar incidence of obesity in women (30.6%) like using BMI, but higher than using WC. Figure 3 shows the distribution of the study group based on three measurements of BMI, WC and WHR according to gender.

DISCUSSION

Recent epidemiological studies of adult population in Slovak Republic (CINDI, MONICA, 1993–2006) clearly indicated increase in prevalence of overweight and obesity. Jurkovičová *et al.* (2003) confirmed the presence of 60.7% of people in the overweight zone and obesity according

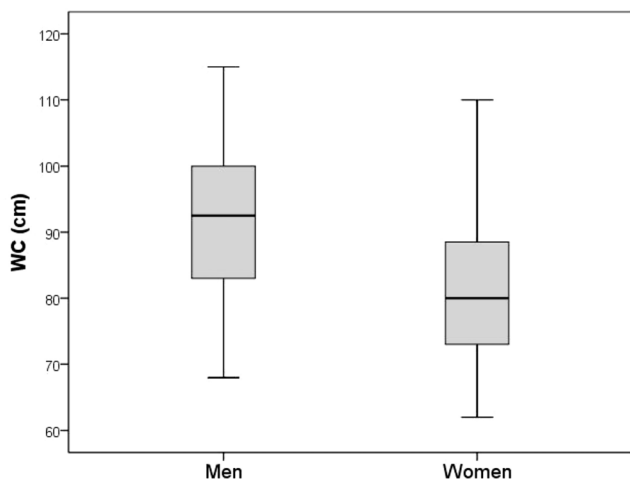


FIGURE 1. Boxplot of WC (waist circumference, cm), by gender. The central line in each box indicates the sample median, the boxes represent the 25th and 75th percentile, whiskers represent the minimum and maximum of observed values.

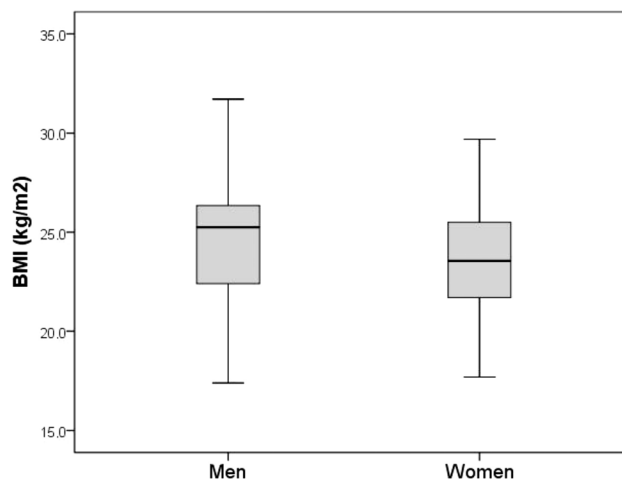


FIGURE 2. Boxplot of BMI (body mass index, kg/m²), by gender. The central line in each box indicates the sample median, the boxes represent the 25th and 75th percentile, whiskers represent the minimum and maximum of observed values.

TABLE 1. Mean of anthropometric variables in adult population of Eastern Slovakia, by gender.

	Women			Men			P-value
	N	Mean	SD	N	Mean	SD	
Age [years]	72	36.2	11.8	64	32.3	13.0	0.075
Height [cm]	72	164.4	6.6	64	180.0	6.5	0.000*
Weight [cm]	72	64.4	9.2	64	81.0	11.0	0.000*
BMI [kg/m ²]	72	23.8	3.2	64	25.0	2.8	0.018*
WC [cm]	72	80.9	10.6	64	92.0	10.6	0.000*
HC [cm]	72	100.1	7.5	64	101.7	8.6	0.067
WHR	72	0.81	0.08	64	0.90	0.07	0.000*

BMI, body mass index; WC, waist circumference; HC, hip circumference; WHR, waist-to-hip ratio; *, statistical significance (P<0.05) calculated using Mann-Whitney U test.

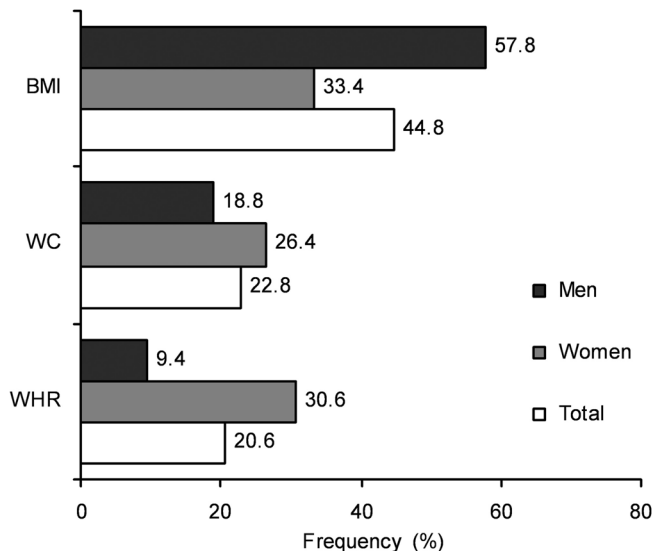


FIGURE 3. Incidence of obesity among the adult population of Eastern Slovakia. Distribution of body mass index ($BMI \geq 25 \text{ kg/m}^2$), waist circumference ($WC \geq 102 \text{ cm}$ in men and $WC \geq 88 \text{ cm}$ in women), and waist-to-hip ratio ($WHR \geq 1$ in men and $WHR \geq 0.85$ in women), by gender.

to BMI classification in Slovak population. In comparison with our results, over 40% respondents of the study group had overweight and obesity (57.8% men and 33.4% women) according to BMI. Using WHR, a higher incidence of obesity was discovered in women (30.6%) than in men (9.4%).

Population studies have shown that people with excess abdominal fat have an excess burden of impaired health and increased cardiovascular risk (WHO 2000). The epidemiological study IDEA Slovakia conducted in 2005, showed a higher prevalence of abdominal obesity in women (56.1%) than in men (31.5%) (Dukát *et al.* 2007). The results of this anthropological study showed the higher incidence of abdominal obesity using WC in women (26.4%) than in men (18.8%), similar to the study mentioned above. Based on strict evaluation criteria of waist circumference ($WC \geq 94 \text{ cm}$ in men, $WC \geq 80 \text{ cm}$ in women), abdominal obesity had 45.4% men and 58.3% women.

This study updates the data on overweight and obesity using the range of anthropometric parameters in adult population of men and women of Eastern Slovakia.

CONCLUSION

The study provides an insight into the relationship between genders and overweight and obesity using a range of anthropometric parameters. Based on BMI alone, the study showed a high incidence of overweight and obesity in both genders. BMI, WC, and WHR give a similar incidence of obesity in women, in men WHR provided the lower prevalence of obesity than WC and BMI. The study showed that waist circumference is a simple measure for abdominal obesity as well as for identifying the need for weight management. More than half of the respondents of the whole group investigated had abdominal obesity and associated risk values of waist circumference for type 2 diabetes, hypertension, and cardiovascular disease.

The study highlights the particular importance of anthropometric measurements as useful indicator for use in epidemiological studies and clinical practice and provides evidence to support the establishment of intervention programmes to prevent further increase in obesity-related disorders.

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