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ANTHROPOMETRIC MEASUREMENTS OF OBESITY IN ROMA: GYPSY POPULATION IN NORTHEASTERN SLOVAKIA

ABSTRACT: The prevalence of obesity has increased dramatically and reached worldwide epidemic proportions over the last two decades. Obesity burdens the health care system, reduces the quality of life, and has serious psychosocial and health consequences. The Roma / Gypsies live in closed communities characterised by high levels of unemployment, extremely low level of education and low socio-economic status with poor living conditions. Poverty and unhealthy lifestyles can have unfavourable effects on their health status. The aim of this study was to determine the prevalence and distribution of overweight and obesity, using anthropometric measurements in the adult Roma population. This cross-sectional study was conducted among 250 adult Roma (112 men and 138 women) aged 20–60 years. Anthropometric measurements included weight, height, waist circumference (WC), hip circumference (HC), body mass index (BMI), waist to hip ratio (WHR), and waist to height ratio (WHtR). The mean value of BMI falls into the overweight range in men as well as in women (26.0±5.5 kg/m² and 26.1±6.8 kg/m², respectively). Based on the WHO classification of obesity assessed by BMI, 51.8% of men and 40.6% of women were of normal weight, 26.8% of men and 21.7% of women were overweight, and 20.6% of men and 28.3% of women were obese. Our research findings revealed more than two-times higher prevalence of abdominal obesity in Roma women than in men. The results of our study indicate the need to implement activities focused on decreasing the prevalence of obesity with the aim of improving Roma health status.

KEY WORDS: Roma/Gypsies – Obesity – Body mass index – Anthropometric measurements – Abdominal obesity

INTRODUCTION

Obesity is a chronic disease characterised by expansion of adipose tissue caused by imbalance between energy intake and expenditure, leading to the storage of the excessive energy as fat (Tremblay *et al.* 2004). The energy balance is regulated by a complex physiological system that requires the integration of several peripheral signals and central coordination in the brain (Bell *et al.* 2005). The prevalence of obesity has increased dramatically and reached worldwide epidemic proportions over the last two decades. Now, obesity represents a serious public health problem and has far-reaching consequences in developed countries (WHO 2004). Obesity burdens the health care system, reduces the quality of life and has serious psychosocial and health consequences because of the increased risk of many serious medical conditions, including type II diabetes, dyslipidemia, hypertension, cardiovascular diseases, osteoarthritis, and some types of cancer (Pi-Sunyer 1993). Not only does the amount of body fat play an important role in determining health risks associated with obesity, but also the pattern of its distribution (Pi-Sunyer 2002). The fat distributed in the abdominal region, particularly visceral fat is more metabolically active than other fat deposits (Mohan, Deppa 2006). Anthropometric measurements such as body mass index (BMI), waist circumference (WC) or

waist to hip ratio (WHR) which reflect both total adiposity and abdominal fatness take an important place in the assessment of obesity in large scale studies. Obesity is also regarded as a multifactorial chronic disease resulting from the complex interplay of a variety of environmental and genetic factors (Pi-Sunyer 2002). Furthermore, population characteristics (age, gender, ethnicity), behavioural factors (dietary pattern, physical activity, smoking), socio-cultural factors (educational level) or socio-economic status might affect the prevalence of obesity (Pi-Sunyer 2002, Seidell, Flegal 1997).

The Roma are an ethnic minority living in many countries throughout the world (Koupilova *et al.* 2001). The genetic data about the Slovak Roma population obtained by a study conducted by Petrejcikova *et al.* (2009) provide significant evidence of their Asian, especially Indian origin. Approximately 350,000 to 380,000 Romanies live in the Slovak Republic (Vaňo 2001), with the highest concentration in the eastern part of the country. The Roma live in closed communities characterised by high levels of unemployment, extremely low level of education and low socio-economic status with poor living conditions. Poverty and unhealthy life style could have unfavorable effects on their health status (Koupilova *et al.* 2001). Since the Roma population has an unhealthy lifestyle with a high prevalence of smoking and low physical activity (Krajcovicova-Kudlackova *et al.* 2004), studies of this population are urgently needed. The purpose of this study was to provide data on the prevalence and distribution of overweight and obesity, using anthropometric measurements in the adult Roma population.

MATERIAL AND METHODS

This cross-sectional study was conducted on a population sample of 250 randomly selected, unrelated adult Roma/Gypsy individuals living in rural areas of the Presov region in Northeastern Slovakia. Roma ethnicity was self-reported. The nature of the study was explained to each participant and the study was conducted after obtaining their written informed consent. The study sample consisted of 112 men and 138 women of age ranging from 20 to 60 years. Personal data was obtained by trained staff using questionnaires. Subjects were also categorised as daily smokers, ex-smokers or non-smokers, with regard to their tobacco usage. We excluded pregnant women and also subjects with the missing questionnaire and anthropometric data.

Anthropometric measurements including weight and height were performed with the participants lightly clothed and without shoes by qualified anthropologists. The body weight was measured to the nearest 0.5 kg using a digital scale and height was measured to the nearest 0.5 cm using anthropometer. Waist circumference was measured midway between the lower costal margin and the iliac crest, and hip circumference at the level of the greater trochanter. The body circumferences were measured using a non-stretchable fibre tape in an erect standing position. This data was used to calculate several indexes for the assessment of obesity. BMI was calculated as weight in kilograms divided by the square of the height in metres (kg/m^2). WHR was calculated as waist circumference divided by hip circumference. On the basis of a BMI criteria according to WHO recommendations, BMI<18.5 kg/m^2 was defined as underweight, BMI 18.5–24.9 kg/m^2 as normal weight, overweight was categorised as BMI 25.0–29.9 kg/m^2, Obesity class I as BMI 30.0–34.9 kg/m^2, Obesity class II as BMI 35.0–39.9 kg/m^2, and Obesity class III as BMI≥40.0 kg/m^2. Abdominal obesity was defined by gender specific cut-off points, WC≥88 cm for women and ≥102 cm for men. WHR criteria were ≥0.85 for women and ≥1.00 for men. A waist to height ratio (WHtR) as effective predictor of metabolic risks was used as an indicator for obesity due to better measurement of the relative fat distribution among subjects, with the same boundary value (0.5) for men and women (Ashwell, Hsieh 2005).

Descriptive statistics are given as sample size and percentages or mean±SD (standard deviation). Because not all variables had a normal Gaussian distribution, we used non parametric tests in our analyses. The Mann-Whitney test was used to compare the mean values of continuous variables. The Pearson chi-square test was used for the analysis of the categorical variables. Test results with P-value equal to or less than 0.05 was considered statistically significant. All statistical analyses were performed using SPSS software (SPSS, Inc., Chicago, IL, USA).

RESULTS

Table 1 shows gender-specific descriptive statistics of the study population. Total number of studied subjects were 250; 112 (44.8%) men and 138 (55.2%) women. The mean age of men and women in the study sample was 33.2±11.7 and 35.7±11.1 years, respectively. The mean value of BMI falls into the overweight range in men as well as in women (26.0±5.5 kg/m^2 and 26.1±6.8 kg/m^2, respectively). For men the mean values of WC, WHR, and WHtR were 94.2±15.5, 0.92±0.09, and 0.56±0.09, respectively. For women, the mean values of WC, WHR, and WHtR were higher than boundary risk values, indicating increased risk of obesity in this group (*Table 1*). The average WHtR was significantly higher in women than in men (P=0.006). No significant difference was observed between men and women with respect to BMI, waist and hip circumferences and WHR. Prevalence of smoking was alarming in both men and women (*Table 2*). Smokers accounted for 73.2% and 69.5% of the men and women, respectively.

The study population was stratified into three age groups: early adulthood (20–29 years), mature adulthood (30–44 years) and middle age (45–60 years). *Table 3* shows comparison of gender specific mean values of

TABLE 1. The basic characteristics of study subjects.

	Men (n=112)		Women (n=138)		
	Mean	SD	Mean	SD	P-value
Age (years)	33.2	11.7	35.7	11.1	0.047
Height (cm)	169.5	7.2	158.4	6.2	<0.001
Weight (kg)	74.8	16.6	65.7	18.3	<0.001
BMI (kg/m²)	26.0	5.5	26.1	6.8	0.657
Waist circumference (cm)	94.2	15.5	93.1	16.6	0.705
Hip circumference (cm)	101.8	9.6	103.2	12.6	0.323
WHR	0.92	0.09	0.90	0.08	0.083
WHtR	0.56	0.09	0.59	0.10	0.006

BMI, body mass index; WHR, waist to hip ratio; WHtR, waist to height ratio; n, number of individuals. P-values represent statistical significance of the comparison between men and women, calculated using Mann-Whitney test.

TABLE 2. Smoking status of study subjects.

	Men		Women		
	n	%	n	%	P-value
Smokers	82	73.2	96	69.5	0.373
Ex-smokers	2	1.8	7	5.1	
Non-smokers	28	25.0	35	25.4	
Total	112	100.0	138	100.0	

n, number of individuals; %, relative frequency. P-values represent statistical significance of the comparison between men and women, calculated using Pearson chi-square test.

anthropometric measurements for each age group. In this study, the mean height peaked within the mature adulthood group (30–44 years), and then there was tendency towards a slight decrease in mean height values in both men and women (*Table 3*). The highest average values of BMI were observed in men and women between ages 45–60 (28.3±4.7 kg/m² and 28.2±6.7 kg/m², respectively). As *Table 3* shows, separate analysis by age also revealed that mean values of BMI, WC, WHR, and WHtR are quite different among these three age groups, with a linear pattern of increment. We have also found significant differences of some anthropometrical parameters between men and women of the same age category, especially in early adulthood (20–29 years) (*Table 3*).

Based on the WHO classification of obesity assessed by BMI, 51.8% of men and 40.6% of women were of a normal weight; 26.8% of men and 21.7% of women were overweight, and 20.6% of men and 28.3% of women were

TABLE 3. Comparison of the mean and SD values, by age.

	Men						Women					
	20–29 years n=52 (46.4%)		30–44 years n=39 (34.8%)		45–60 years n=21 (18.8%)		20–29 years n=44 (31.9%)		30–44 years n=61 (44.2%)		45–60 years n=33 (23.9%)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Height	169.1	7.7	170.3	7.4	169.3	5.7	156.3	5.4*	160.4	6.5*	157.3	5.4*
Weight	72.0	16.9	75.1	16.8	81.1	14.1	57.1	17.8*	69.6	17.4	69.9	17.2*
BMI	25.2	5.9	25.8	5.0	28.3	4.7	23.3	7.1*	27.0	6.1	28.2	6.7
WC	92.8	15.4	93.5	15.8	98.9	15.1	85.2	15.1*	95.5	16.0	99.3	16.0
HC	101.5	10.2	101.2	9.1	106.7	9.4	97.2	12.6*	105.3	11.8	107.4	11.0
WHR	0.9	0.1	0.9	0.1	1.0	0.1	0.9	0.07*	0.9	0.1	0.9	0.1
WHtR	0.6	0.1	0.6	0.1	0.6	0.1	0.6	0.1	0.6	0.10*	0.6	0.1

Age in years, height in cm, weight in kg. BMI, body mass index in kg/m²; WC, waist circumference in cm; HC, hip circumference in cm; WHR, waist to hip ratio; WHtR, waist to height ratio; n (%), number (relative) frequency of individuals. *, statistical significance at the 5% significance level of the comparison of mean values between men and women in the same age group, calculated using Mann-Whitney test.

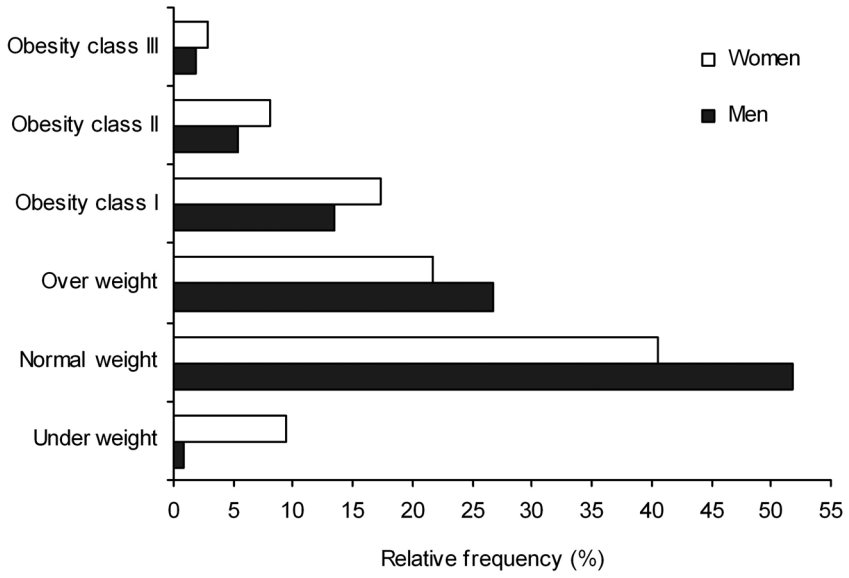

FIGURE 1. Obesity classification according to BMI.

TABLE 4. Frequency distribution of Roma men and women according to WC, WHR, and WHtR.

		Men			Women			
		Cut-offs	**n**	**%**	**Cut-offs**	**n**	**%**	**P-value**
WC	No risk	<94.0	60	53.6	<80.0	24	17.4	<0.001
	Increased risk	94.0–101.9	20	17.9	80.0–87.9	28	20.3	
	Very increased risk	≥102.0	32	28.6	≥88.0	86	62.3	
WHR	No risk	<1.00	89	79.5	<0.85	33	23.9	<0.001
	Increased risk	≥1.00	23	20.5	≥0.85	105	76.1	
WHtR	No risk	<0.5	35	31.3	<0.5	21	15.2	0.002
	Increased risk	≥0.5	77	68.8	≥0.5	117	84.8	

WC, waist circumference; WHR, waist to hip ratio; WHtR, waist to height ratio; n (%), number (relative frequency) of individuals. P-values represent comparison of distribution between men and women (Pearson chi-square test).

obese. *Figure 1* shows the detailed distribution of obesity in the study population based on critical values of BMI.

The prevalence of underweight in men was far less than in women. This study found that 13.4% of men and 17.4% of women had Obesity class I, 5.4% of men and 8% of women had Obesity class II, 1.8% of men and 2.9% of women had Obesity class III (*Figure 1*). *Table 4* presents the distribution of number and percentage of sampled Roma subjects by critical values of WC, WHR, and WHtR according to gender. The proportion of women with WC in range 80.0–87.9 was 20.3%, whereas the proportion of men with WC in range 94.0–101.9 was lower (17.9%). In contrast, comparing WC clearly shows a higher percentage of no risk subjects and lower percentage of subjects with very increased risk in the men than in the women's group. When comparing the prevalence of abdominal obesity by WHR, there is more than three-times higher percentage of subjects with increased health risk among women than among men (76.1% vs. 20.5%). When we looked to the prevalence of WHtR categories, it is striking that 68.8% of men and 84.8% of women have increased health risk (*Table 4*).

DISCUSSION AND CONCLUSION

Our study shows strikingly high prevalence of obesity in the Roma / Gypsy population in Slovakia. We report the gender-specific obesity prevalence assessed by BMI criteria. Our results revealed 20.6% of men and 28.3% of women were obese. When compared with Slovak majority (17.3% in men and 13.9% in women) (Stovcikova 2010) the presence of obesity in Roma was much higher, especially in Roma women. In our study the mean value of BMI in Roma men was 26.0±5.5 kg/m² and 26.1±6.8 kg/m² in women, which is in accordance with the results

of the other studies. Very similar findings were also reported in the study of Krajcovicova-Kudlackova *et al.* (2004), where average value of BMI was 26.2±0.5 kg/m² regardless of gender and the incidence of overweight and obesity among Gypsy population was a little higher (52.0%) in comparison with our results. Ginter *et al.* (2001) and Vozarova de Courten *et al.* (2003) also described a very high prevalence of obesity, which was explained by the presence of risk factors such as lifestyle habits, poor living conditions, and high percentage of unemployment, physical inactivity, low educational level and low socio-economic status. The association of obesity with the poverty seems to be a paradox of the economically developing world (Simko, Ginter 2009). Nevertheless, low education level is associated with a lower knowledge about optimal nutrition (Krajcovicova-Kudlackova *et al.* 2004). The Roma population is well known for their unhealthy dietary habits with low consumption of protective food (vegetables and fruit), high consumption of animal fat and high prevalence of smoking (Krajcovicova-Kudlackova *et al.* 2004, Nozdrovicky 1991, Valachovicova *et al.* 2003).

Although obesity is usually classified by BMI criteria, increased BMI defines rather general adiposity and does not determine the difference between subcutaneous and visceral fat accumulation. Considering that the increase of metabolically active abdominal adipose tissue can lead to metabolic disturbances that contribute to other chronic diseases (cardiovascular diseases, T2DM, metabolic syndrome) (Vozarova de Courten *et al.* 2003), WC and WHR index seem to be better anthropometric measures in predicting total health risk. The presence of abdominal obesity assessed according to waist circumference was 28.6% in Roma men and 62.3% in Roma women, whereas in Slovak men it was 15.5% and in women 21.4% (Fabryova, Raslova 2004). The results of our study revealed an extremely high prevalence of abdominal obesity in Roma women, where the prevalence of obesity determined by WC index was more than two-times higher and by WHR index more than three-times higher than in men. We also demonstrated that BMI, WC, WHR, and WHtR increased with age. The higher prevalence of abdominal obesity in Roma women compared to men, with higher mean values of WC and WHR in older women, can be explained by the effect of hormonal changes post-menopause. The high prevalence of obesity in Roma / Gypsy population may be also a reflection of their cultural traditions. They believe that weight is a sign of good health and affluence and that the more a person weighs, the luckier and healthier he or she will be (Vivian, Dundes 2004).

In conclusion, the prevalence of obesity (mainly abdominal obesity) in Roma / Gypsy population is high, especially in Roma women. It must be mentioned that abdominal obesity along with smoking is serious risk factor which can cause permanent consequences to health, and it is therefore necessary to continuously perform studies of Roma health conditions and subsequently to carry out activities focused on improving Roma health status.

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