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THE PREVALENCE OF OBESITY IN THE CZECH POPULATION ACCORDING TO DIFFERENT NORMATIVE CRITERIA

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Abstract

Accurate assessment of obesity depends on the accurate measurement of body fat. However, in praxis, we often use simple anthropometric indices. The main objective of this study is the comparison of the obesity rate expressed by anthropometric indices (BMI, waist/hip ratio - WHR) with the expression in %body fat in different age and gender groups of the Czech population. Indicators of obesity were investigated in a sample of 569 subjects (273 men, 296 women), divided into 6 age categories. According to measured values of % body fat, 19.8% of Czech men and 43.6% of women fall into the obese category. If we set the criterion for obesity at BMI 25 kg/m^2, then the obese category includes 52% men and 38.2% women. Based on the WHR, we can say that 37.4% men and 56.1% women fall into the category of obese people. All the used indicators of obesity demonstrate the fact that the percentage of obese persons in the Czech population is high and increases with age. The results differ markedly in dependence on the used methods.

1. Introduction

Obesity is a metabolic disorder that is characterized by an increased proportion of fat on the body mass and is accompanied by a concomitant rise of body weight above the normal range. Accurate assessment of obesity depends on the accurate measurement of body fat. However, in praxis, we often use simple anthropometric indices: BMI (body mass index) and waist-to-hip ratio (WHR).

BMI is by far the most frequently used indicator of obesity and can be computed easily from height and weight. The standard cut-off points defining overweight and obesity were defined by WHO on the basis of BMI (body mass index) and are presented in Table 1. According to this classification, persons with

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BMI 18.5-24.9 kg/m^2 are considered normal, those with BMI 25.0-29.9 kg/m^2 as overweight, and individuals with BMI above 30.0 kg/m^2 as obese.

Table 1. *Classification of overweight and obesity in adults according to BMI (taken from Chan R.S. & Woo J., 2010)*

Classification	BMI	Risk of co-morbidities
Underweight	18.5	low
Normal range	18.5-24.9	average
Overweight	25.0-29.9	increased
Obese class I	30.0-34.9	moderate
Obese class II	35.0-39.9	severe
Obese class III	≥40.0	very severe

The disadvantage of BMI lies in the fact that it is unable to differentiate between body fat and lean body mass. For example, women have ca. 10% more fat than men at the same BMI (Jackson A.S., et al. 2002; Larsson I., et al. 2004). As a result, many overweight individuals are misclassified as normal or vice versa (Burkhauser R.W. & Cawley J., 2008). In fact, BMI correlates more with the total amount of fat mass than with %fat (Sun Q., et al. 2010).

WHR is the most widely used indicator of abdominal obesity and correlates well with the prevalence of health risks (cf. Dalton M., et al. 2003; Esmaillzadeh A., et al. 2004). A high WHR (>1.0 in men and >0.85 in women) indicates excessive abdominal fat accumulation (Han T.S., et al. 1997). According to WHO, WHR indexes >0.8 in women and >0.9 in men correspond with the BMI overweight range of 25–29.9 kg/m^2 (WHO, 2000). In the study of Larsson I., et al. (2004), BMI 25 and 30 kg/m^2 in men corresponded to WHR 0.92 and 0.97 respectively. In women, the analogous numbers were 0.84 and 0.89. Ho S.Y., et al. (2003) recommend 0.85 in men and 0.80 in women as cut-off values indicating cardiovascular risk. Łopatyński et al. (2003) suggest 0.91 in women and 0.97 in men as as indicators of higher diabetes mellitus type 2 risk.

However, the use of WHR has its limitations, because the measurement of hip circumference is more difficult to perform and the ratio between waist and hip circumference can remain constant when the weight of individual increases or decreases. In some studies, WHR also appears as a less reliable indicator of health risks when compared with waist circumference and waist-to-height ratio (Taylor R.W., et al. 1998; Ho S.Y., et al. 2003; Schneider H.J., et al. 2007). A meta analysis of 10 studies by Lee et al. (2008) showed that the best indicator of health risk is the waist-to-height ratio, followed closely by WHR and waist circumference. The device InBody defines WHR 0.80 as subnormal, 0.80-0.90 as normal, and >0.90 as abnormal (overweight).

For *body fat*, there currently exist no international standards (Ho-Pham L.T., et al. 2011). Perhaps the most frequently cited cut-off points are those of Gallagher et al. (2000). (Table 2) The device InBody defines obesity as more than 25% fat in men and 30% in women.

Table 2. *Cut-off points of %body fat corresponding to BMI values that are used as guidelines for assessing obesity (after Gallagher D., et al. 2000)*

Sex and BMI	*20-39 y*	*40-59 y*	*60-79 y*
Women			
BMI □18.5	*21*	*23*	*24*
BMI ≥25.0	*33*	*34*	*36*
BMI ≥30.0	*39*	*40*	*42*
Men			
BMI □18.5	*8*	*11*	*13*
BMI ≥25.0	*20*	*22*	*25*
BMI ≥30.0	*25*	*28*	*30*

Recent reports about the prevalence of obesity in the Czech population are alarming, although the situation is more serious among adults than among children and adolescents. According to Mulvihill et al. (2006), only 0.5% Czech girls and 1.6% Czech boys at the age of 15 years are obese (BMI ≥30 kg/m^2), and 5% girls and 11.5% boys were overweight (BMI 25.0-29.9 kg/m^2). These data were below the average of studied countries. For example, the analogous numbers in USA are 5.3% in girls and 10.5% boys in the obese category. This picture was recently confirmed by Kunešová et al. (2007): Only 6% Czech adolescents in the age range 13-17 years were overweight and 4% were obese. However, among Czech adults, these numbers rise sharply. Kunešová et al. (2007) reported that in 2005, 35% Czech adults suffered from overweight and 17% were obese. These data would classify Czech republic among Top 10 most obese nations in the world (http://www.oecd-ilibrary.org). Most of individuals with excessive weight are men and old people.

The main objective of this study is the comparison of the obesity rate expressed by anthropometric indices (BMI and WHR) with the expression in %body fat in different age and gender groups of the Czech population.

2. Material and methods

This research was implemented within the framework of the project "Creating a research team for the purpose of determining the level of physical activity (inactivity) in selected age groups of the population of men and women in the Czech Republic" (CZ.1.07/2.3.00/20.0044). The project is financed by the European Social Fund and the state budget of the Czech Republic.

- Indicators of obesity were investigated in a sample of 569 subjects (273 men, 296 women), divided into 6 age categories (category 18-29 years=category 1, n = 197; category 30-39 years=category 2, n = 132; category 40-49 years=category 3, n=79; category 50-59 years=category 4, n=43; category 60-69 years=category 5, n=73; category 70+ years=category 6, n=45). All indicators of obesity (BMI, WHR and % body fat) were measured under standard conditions using the bioelectrical impedance device InBody720 (6 frequencies). The comparison of the obesity rate expressed by different indicators was performed with the help of descriptive statistics.

3. Results and Discussions

Results are summarized in Table 3 and on Figures 1-3. If the criterion for obesity in BMI values is 30 kg/m^2, 11.7% men and 10.8% women can be classified as obese. If we set the criterion for obesity at 25 kg/m^2, then the obese category includes 52% men and 38.2% women. Again, the percentage of obese persons increases with age.

Based on the waist/hip ratio (WHR), we can say that 37.4% men and 56.1% women fall into the category of obese people. Like in the two previous indicators, the representation of obese people increases with age. Nevertheless, an exception of this trend is the category 6, where we documented a slight decline in the percentage of obese persons.

According to measured values of %body fat, 19.8% of Czech men and 43.6% of Czech women fall into the obese category (=more than 25% fat in men and 30% in women). Normal values of %body fat (8-25% in men and 10-30% in women) were found in 75.5% men and 53.4% women. Below average values (less than 8% in men and 10% in women), i.e. a lack of fat, were determined in 4.8% men and 0.3% women. The percentage of obese persons increases with age (category 1: 13.7%, category 2: 28%, category 3: 29.1%, category 4: 44.2%, category 5: 67.1%, category 6: 80%).

Table 3. *BMI, WHR and % body fat in examined men a women.*

Age group	gender	n	BMI	BMI conf. int.	WHR	WHR conf. int.	fat %	fat % conf. int.
1	M	111	24,18595	3,002832	0,874054	0,040416	13,71144	5,950457
1	F	86	22,36407	3,109027	0,839884	0,045283	25,36698	6,318459
2	M	65	25,68123	3,949778	0,892615	0,044801	18,93492	7,086063
2	F	67	23,84701	4,045372	0,858657	0,058773	26,54687	7,466690
3	M	43	26,96791	2,677847	0,905814	0,034794	21,06837	6,011726
3	F	36	24,10611	2,900806	0,870833	0,039740	28,75167	5,797620
4	M	20	26,26200	3,087001	0,912000	0,044081	21,45800	5,259251
4	F	23	24,99043	3,941995	0,884348	0,062364	30,69087	6,678758
5	M	19	28,02316	4,526146	0,920000	0,052493	24,32000	8,865506
5	F	54	26,94278	4,313485	0,905741	0,054517	34,25963	7,870028
6	M	15	28,25800	3,542532	0,923333	0,048206	28,97133	5,014712
6	F	30	27,14867	4,199042	0,904333	0,055191	35,94533	7,583145
All Groups		569	25,00548	3,923831	0,880580	0,053318	23,92622	9,548629

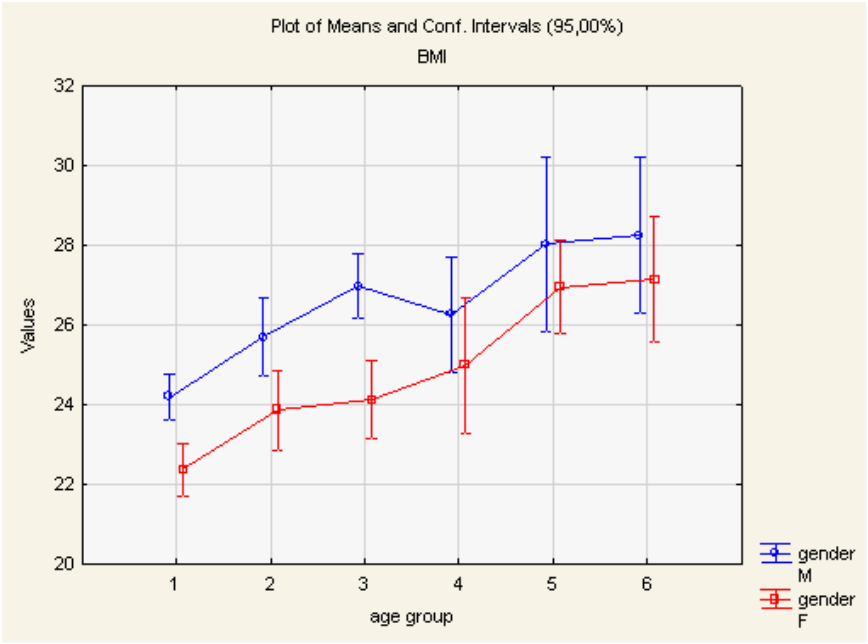

Figure 1. *BMI values in the examined age groups of men and women. Differences between genders are statistically significant (p□0.05) only in the age groups 1-3.*

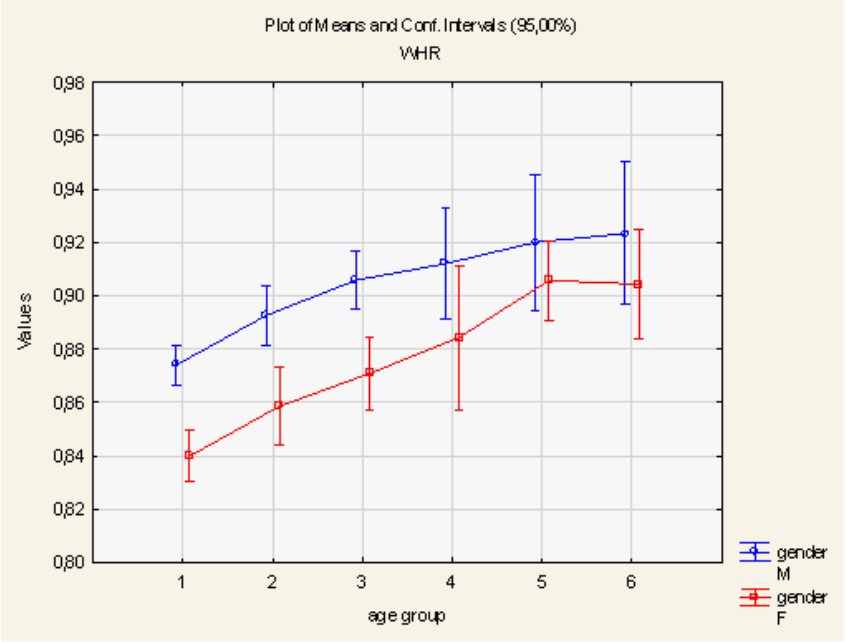

Figure 2. *WHR values in the examined age groups of men and women. Differences between genders are statistically significant (p□0.05) only in the age groups 1-3. The difference in the age group 4 approaches statistical signifance (p=0.058).*

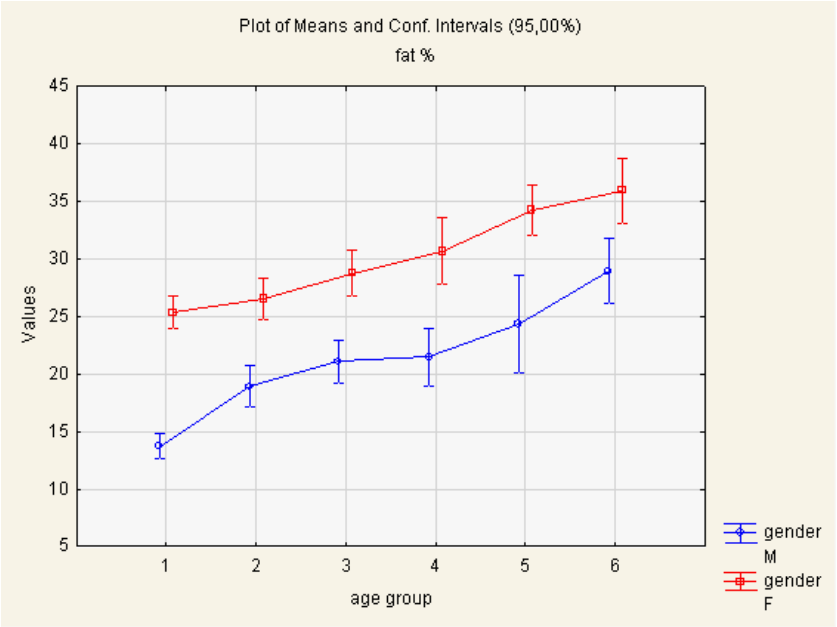

Figure 3. *Differences in the percentage of body fat in the examined age groups of men and women. Differences between genders are always statistically significant in every age group (p□0.05).*

All the used indicators of obesity demonstrate a well-known fact that the percentage of obese persons in the Czech population is high. On the other hand, it is striking that the results differ markedly in dependence on the used methods. The progressive increase of obese persons in the higher age groups can be attributed mainly to decreasing physical activity.

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