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The Prevalence of Overweight and Obesity among Croatian Hospitalized Coronary Heart Disease Patients

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A B S T R A C T

The aim of this article was to investigate the prevalence of overweight and obesity using selected anthropometric variables in a sample of hospitalized coronary heart disease (CHD) patients in Croatia (N=1,298). Prevalence of overweight and obesity in surveyed patient population was high: 48.2% of participants were overweight and 28.6% were obese according to their body mass index; measured through waist-to-hip ratio 54.5% of participants were centrally obese. These data on prevalences of overweight, obesity and central obesity show that although there are some reassuring trends, there is still considerable amount of work to be done if the prevalence of this cardiovascular risk factor is to be reduced further among Croatian CHD patients. While the prevalence of obesity seems to be on the decline, the prevalence of overweight is rising, which may be just an early warning sign of an incoming wave of obesity epidemic in future years.

Key words: *coronary heart disease, cardiovascular risk factor, overweight, obesity, central obesity, Croatia*

Introduction

Overweight and obesity are connected with development of cardiovascular disease (CVD)[1,2] and mortality from CVD[3]. Besides these effects, the presence of obesity includes various health problems (such as sleep disorders, dyspnoea during mild exertion, sweating, social stigmatization and discrimination, etc.) which all reduce the quality of life, increasing the risk of depression[4,5] and shortening one's expected life expectancy for 5–20 years[6]. A special subcategory is central obesity (as measured through waist-to-hip ratio – WHR), since it has additional negative effects on one's health – it increases the risk for cardiometabolic diseases[7], incidence of cardiovascular events[8] and mortality from cardiovascular and malignant diseases[9]. The results of the famous Framingham Offspring study, in which the body mass index (BMI) was used to determine presence of obesity, have shown that presence of obesity is significant for prediction of occurrence of coronary heart disease (CHD) and cerebrovascular disease[10].

The World Health Organization (WHO) recommends that men have a waist circumference of up to 102 cm, and women of up to 88 cm[11], while WHR of >1 for men, and >0.85 for women is considered indicative for obesity[12]. European Society of Cardiology (ESC) Guidelines from 2007 recommend to keep the BMI <25 kg/m^2 and avoidance of central obesity as a measure in primary prevention (it is advised that men with waist circumference 94–102 cm and women with waist circumference 80–88 cm do not increase their weight, while men with waist circumference bigger than 102 cm and women with waist circumference bigger than 88 cm are strongly advised to

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reduce their body weight)[13,14]; in the field of secondary prevention it is recommended in patients which have had a myocardial infarction with ST-segment elevation to reduce their body weight when their BMI is ≥30 kg/m^2 and when their waist circumference is >102/88 cm (men/women)[15]. While all the used measures of overweight and obesity can be confusing, both for the health professional and for the patient, it is reassuring that the 2007 ESC Guidelines explicitly state that there is no single best measure of overweight/obesity and central obesity, and it is possible to use BMI, WHR or just waist circumference when estimating the risk[13,14]. Croatian Adult Health Survey (CAHS) data from 2003 showed that 38.11% of the surveyed population was overweight (BMI ≥25 kg/m^2), 20.34% was obese (BMI ≥30 kg/m^2) and that 43.52% had increased waist circumference. In men the prevalences were 43.2%, 20.1% and 34.98% respectively, while in women they were 33.6%, 20.6% and 51.13%. The authors concluded that as much as 60% of adult population in Croatia was overweight, and as much as 40% was centrally obese[16,17].

Materials and Methods

The survey included 1,298 patients hospitalized between October 1st 2007 and January 7th 2010 for acute or chronic CHD in various hospitals in Croatia. It was performed in the above mentioned period in Dubrava University Hospital (Zagreb), Sveti Duh University Hospital (Zagreb), Bjelovar General Hospital, Čakovec General Hospital, Karlovac General Hospital, Koprivnica General Hospital, Slavonski Brod General Hospital, Varaždin General Hospital, Rijeka University Hospital Centre, Pula General Hospital, Split University Hospital Centre, Dubrovnik General Hospital and Zadar General Hospital.

A special questionnaire was produced for this study which allowed recording of required data. Questionnaire was made after series of consultations with experts and literature and it was compiled by model of large clinical trials conducted in Europe and Croatia [INTERHEART[18], EUROASPIRE (European action on secondary prevention by intervention to reduce events) I[19] and II[20], EH-UH (Epidemiology of hypertension in Croatia)[21], TASPIC-CRO (Treatment and secondary prevention of ischemic coronary events in Croatia)[22]]. This allowed the investigators to be able to efficiently compare results. Most of the questions had multiple answers offered in advance to acquire greater accuracy. Data was collected on patient history (personal and family history), age, sex and information on cardiovascular risk factors and discharge diagnoses. Physical examination was performed, results of which were recorded – weight, height, waist circumference and hip circumference. Weight and height were measured while the patient was in light clothes without shoes. The scales that were used were calibrated. This data was used to calculate the body mass index (BMI, weight in kg divided with square of height in meters, unit is kg/m^2). Overweight was defined as BMI ≥25, and <30 kg/m^2; obesity was defined as BMI ≥30 kg/m^2; as described in the 2007 ESC Guidelines for the prevention of CVD[13,14]. Patient's waist and hip circumferences were also measured in order to perform the calculation of waist to hip ratio (WHR, waist circumference in centimetres divided by hip circumference in centimetres). WHR values indicative of central obesity were those >0.85 in women and >1 in men[12].

Data were collected by physicians or trained personnel (nurse), coded and entered into the electronic file. Confidentiality of data was ensured in accordance with current applicable codes, declarations and other provisions. The results are shown in tables, and for quantita-

TABLE 1
DISTRIBUTION OF SUBJECTS ACCORDING TO THE VALUE OF THEIR BMI

Body mass index (BMI)	N	Percentage (%)
<19 kg/m^2	7	0.5
19–24.99 kg/m^2	290	22.6
25–29.99 kg/m^2	618	48.2
≥30 kg/m^2	367	28.6
Total	1282	100.0

BMI – body mass index, kg – kilogram, m – meter

TABLE 2
DISTRIBUTION OF SUBJECTS ACCORDING TO SELECTED ANTHROPOMETRIC VARIABLES

Selected anthropometric variables	N	Mean	SD	Min.	Percentiles			Max.
					25.	50. (Median)	75.	
Weight (kg)	1283	83.38	13.97	16.00	75.00	83.00	92.00	161.00
Height (cm)	1283	172.31	9.20	104.00	166.00	173.00	178.00	198.00
BMI (kg/m^2)	1282	28.10	4.41	4.58	25.27	27.59	30.48	68.42
Waist circumference (cm)	1221	100.38	14.38	33.00	93.00	100.00	109.00	195.00
Hip circumference (cm)	1209	102.38	12.49	37.00	96.00	102.00	110.00	151.00
WHR	1209	0.98	0.12	0.64	0.91	0.97	1.04	1.87

N – number, SD – standard deviation, Min. – minimum, Max. – maximum, kg – kilogram, cm – centimetre, BMI – body mass index, WHR – waist to hip ratio

tive variables descriptive statistics were done with appropriate measures of central tendency and variability (mean, standard deviation, medians, associated interquartile ranges). Normal distribution of quantitative variables was tested by Kolmogorov-Smirnov test, and then appropriate parametric (t-test for independent samples and analysis of variance – ANOVA) or nonparametric tests (Mann-Whitney U test, Kruskal-Wallis test) were used. The χ^2-test was also used.

Statistically significant results were considered those with p values <0.05. Statistical analysis was made using the software PASW version 17.02 (Chicago Inc., IL, www.spss.com).

Results

Table 1 shows the distribution of subjects according to the value of their BMI. 48.2% of subjects were overweight, and 28.6% were obese, the data was not available for 16 subjects. The data on the measured anthropometric variables (weight, height, BMI, waist circumference, hip circumference, WHR) is shown in Table 2. Comparison of selected anthropometric variables according to sex is shown in Table 3. Only for BMI there were no statistically significant differences according to sex. Male subjects have statistically significantly larger body weight (86.34±12.97 kg *vs*. 76.15±13.73 kg, p< 0.001) and bigger height (175.86±7.37 cm *vs*. 163.64±7.30 cm, p<0.001). Male subjects also have larger waist circumference, hip circumference and WHR (waist circumference: 101.46±14.11 cm *vs*. 97.72±14.71 cm, p<0.001; hip circumference: 101.51±11.86 cm *vs*. 104.49±13.72 cm, p=0.002; WHR: 1.00±0.11 *vs*. 0.94±0.12, p<0.001). For all comparisons Mann-Whitney U test was used. Comparison of subjects according to their sex and BMI group presented in Table 4 showed borderline statistical significance in a way that males were more frequently overweight (49.8% *vs*. 44.4%, p=0.054, χ^2 test) and that females were more frequently obese (32.8% *vs*. 26.9%, p=0.054, χ^2-test).

TABLE 3
SELECTED ANTHROPOMETRIC VARIABLES ACCORDING TO SEX

Selected anthropometric variables	Sex	N	Mean	SD	Min.	Percentiles			Max.	p
						25.	50. (Median)	75.		
Weight (kg)	Male	911	86.34	12.97	16.00	78.00	85.00	95.00	161.00	<0.001
	Female	372	76.15	13.73	48.00	65.13	75.00	84.00	142.00	
Height (cm)	Male	911	175.86	7.37	104.00	171.00	176.00	180.00	198.00	<0.001
	Female	372	163.64	7.30	145.00	160.00	163.50	168.00	188.00	
BMI (kg/m^2)	Male	910	27.95	4.22	4.58	25.25	27.47	30.20	68.42	0.171
	Female	372	28.45	4.83	16.33	25.39	27.68	31.14	49.54	
Waist circumference (cm)	Male	868	101.46	14.11	33.00	94.00	100.00	110.00	195.00	<0.001
	Female	353	97.72	14.71	45.00	89.00	98.00	107.00	139.00	
Hip circumference (cm)	Male	858	101.51	11.86	37.00	96.00	101.00	108.00	151.00	0.002
	Female	351	104.49	13.72	57.00	96.00	103.00	112.00	145.00	
WHR	Male	858	1.00	0.11	0.75	0.94	0.98	1.05	1.87	<0.001
	Female	351	0.94	0.12	0.64	0.86	0.92	1.00	1.48	

Mann-Whitney U test was used, p<0.05 is considered statistically significant
N – number, SD – standard deviation, Min. – minimum, Max. – maximum, kg – kilogram, cm – centimetre, BMI – body mass index, WHR – waist to hip ratio

TABLE 4
COMPARISON OF SUBJECTS ACCORDING TO SEX AND THEIR BMI GROUP

Sex	BMI (groups)				Total
	<19 kg/m^2	19–24.99 kg/m^2	25–29.99 kg/m^2	≥30 kg/m^2	
Male	3 (0.3%)	209 (23.0%)	453 (49.8%)	245 (26.9%)	910 (100.0%)
Female	4 (1.1%)	81 (21.8%)	165 (44.4%)	122 (32.8%)	372 (100.0%)
Total	7 (0.5%)	290 (22.6%)	618 (48.2%)	367 (28.6%)	1282 (100.0%)

χ^2=7.648; df=3; p=0.054
χ^2 test was used, p<0.05 is considered statistically significant
% – percent, df – degrees of freedom

TABLE 5
CENTRAL OBESITY ACCORDING TO SEX

Sex	WHR (groups)		Total
	≤1 for M or ≤0.85 for F	>1 for M or >0.85 for F	
Male	478 (55.7%)	380 (44.3%)	858 (100.0%)
Female	72 (20.5%)	279 (79.5%)	351 (100.0%)
Total	550 (45.5%)	659 (54.5%)	1209 (100.0%)

χ^2=124.455; df=1; p<0.001; F – female; M – male

Subjects were also divided into two groups according to their WHR values – one with increased WHR (>1 for males or >0.85 for females) and one with WHR values within normal range (≤1 for males or ≤0.85 for females). A total of 659 subjects (54.5%) were centrally obese – had increased WHR, and 550 subjects (45.5%) had WHR within normal range. Data on WHR were not available for 89 subjects. Prevalence of central obesity in females was almost double than in males (79.5% *vs*. 44.3%, p< 0.001, Table 5, χ^2-test).

Discussion

Our group presents in this article the available data on the prevalence of overweight, obesity and central obesity among Croatian hospitalized CHD patients. This risk factor is one of interim risk factors for CVD and, although modifiable, represents a more complex type of cardiovascular risk than behavioural risk factors such as smoking or physical inactivity[23].

There is substantial evidence in currently available literature which shows that presence of overweight and obesity is strongly connected with numerous risk factors for the development of CVD[1,2] and cardiovascular mortality[3]. Severe obesity has been shown to significantly reduce life expectancy for 5–20 years[6]. Some estimates say that at the turn of the century over one billion people were overweight, of which at least 300 million were obese; this supports the broad consensus that today we can truly speak of global epidemic of overweight and obesity[24]. In this context, central obesity plays a critical role, as it bears additional health risks, such as insulin resistance[25], increased risk for occurrence of cardiometabolic diseases[7] and increased incidence of cardiovascular events[8]; as it increases mortality both from cardiovascular and malignant diseases[9]. Recently published data suggest that obesity prevalence is increasing worldwide in parallel with type 2 diabetes[26].

It is no wonder that BMI is frequently used in clinical practice, as it is frequently available from records from everyday clinical practice, modifiable with lifestyle changes and it has been shown that its reduction has favourable effects on other cardiovascular risk factors[27]. Physicians and other health professionals should be encouraged to always record patient weight and height.

When comparing the data from this study with other recent and relevant studies that were also performed in Croatian CHD patient population, comparisons are principally only possible with only one other study which also recorded data on the prevalence of overweight and obesity – the study on European action on secondary prevention by intervention to reduce events (EUROASPIRE III)[28] which was performed in 22 European countries in 2006, one of the countries that participated was also Croatia.

As much as 48.2% of subjects in the surveyed population were only overweight and 28.6% were obese (Table 1). There were some statistically significant differences according to sex, men are bigger and heavier than women, they have larger both waist and hip circumference, and WHR when compared to women (Table 3). When compared to the available data from EUROASPIRE III, where there were 35% of obese CHD patients in the whole European sample and 39% in the Croatian sample[28], one can see a modest decrease in the prevalence of obesity in this population, which is good news and provides hope that at least some of the preventive measures that have been undertaken seem to be effective in practice. While men seem to be statistically borderline significantly more frequently overweight than women (49.8% vs. 44.4%, p=0.054, χ^2 test), this observed statistically borderline significant difference in prevalence of obesity in women (32.8% vs. 26.9% in men, p=0.054, Table 4) in our surveyed population was also observed in EUROASPIRE III study, but in that study from 2006 this difference was fully statistically significant (45% in females vs. 32% in males)[28,29]. Interestingly enough, our findings from the population of Croatian CHD patients seem to mirror those from CAHS from year 2003, where the prevalences of obesity were similar in men and women, but overweight was more frequent in men and central obesity was more frequent in women (over half of female general population was centrally obese!)[16].

Measurement of WHR as a measure of central obesity has shown that as much as 54.5% of surveyed subjects are centrally obese. Again, comparison with the data from EUROASPIRE III (where central obesity was defined only by measure of waist circumference) on the European level there were 53% of centrally obese patients, while at the same time in the Croatian sample there were 78.8% of CHD patients in this category[28], so here, like in the case of obesity as measured through BMI, it is not exaggerated to say that findings from our study do give some reassuring data, at least in the field of obesity. However, one should bear in mind that persons with normal BMI, but increased waist circumference have 20% higher risk of dying than persons with normal BMI and waist circumference within normal range as recommended by the WHO (102 cm for men, 88 cm for women)[11].

Presented data on prevalences of overweight, obesity and central obesity show that although there are some reassuring trends, there is still considerable amount of work to be done if the prevalence of this cardiovascular risk is to be further reduced factor among Croatian CHD

patients. While the prevalence of obesity seems to be on the decline, the prevalence of overweight is rising, which may be just an early warning sign of an incoming wave of obesity epidemic in future years. It is only the next studies in this area in the following years that will confirm or dispute this sign. In the meantime, it is imperative that the work on prevention of overweight and obesity continues, so that, hopefully, this cardiovascular risk factor can further be reduced.

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PREVALENCIJA PREKOMJERNE TJELESNE TEŽINE I PRETILOSTI U HOSPITALIZIRANIH KORONARNIH BOLESNIKA U HRVATSKOJ

S A Ž E T A K

Cilj ovog rada bio je pokazati prevalenciju prekomjerne tjelesne težine i pretilosti uz izabrane antropometrijske varijable na uzorku bolesnika hospitaliziranih zbog koronarne bolesti u Republici Hrvatskoj (N=1,298). Prevalencija prekomjerne tjelesne težine i pretilosti u ispitivanoj populaciji bila je visoka: 48,2% ispitanika imalo je prekomjernu tjelesnu težinu i 28,6% bilo je pretilo (mjerenom putem indeksa tjelesne mase), dok je 54,5% ispitanika bilo centralno pretilo (mjereno putem omjera struk-bokovi). Prikazani podaci o prevalencijama prekomjerne tjelesne težine, pretilosti i centralne pretilosti pokazuju da, iako postoje neki ohrabrujući trendovi, još uvijek je potrebno dosta učiniti kako bi se prevalencija ovog čimbenika rizika za kardiovaskularnu bolest dodatno smanjila kod bolesnika s koronarnom bolesti u Hrvatskoj. Dok se čini kako se prevalencija pretilosti smanjuje, raste prevalencija prekomjerne tjelesne težine, što bi mogao biti samo rani znak upozorenja nadolazećeg vala epidemije pretilosti u idućim godinama.