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Medical and Psychological Parameters in Overweight and Obese Persons Seeking Treatment

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A B S T R A C T

The aim of the study was to analyse psychological characteristics and medical parameters in obese and overweight to identify the possible psychosocial consequences of obesity that may occur along with the numerous medical problems associated with excess body weight. Analysis was made on 296 patients (103 males and 193 females, median age 50, range 16–81) divided in three groups, depending on their Body mass index (BMI). Group I included 41 patients with BMI ranging from 25 to 29.9, group II included 170 patients with BMI from 30 to 34.9, and group III 85 patients with BM ≥ 35. We compared medical (glucose, cholesterol, triglycerides, HDL-cholesterol, systolic and diastolic blood pressure, body fat percentage) and psychological parameters (anxiety, depression, pros and cons of losing weight, self efficacy and four stages of change) in the patients included in the study. Univariate analysis has shown statistically significant difference among obese and overweight patients in goal weight, systolic and diastolic blood pressure, body fat percentage, glucose and cholesterol serum level. People with higher BMI (>30) found more advantages (pros) over disadvantages (cons) of weight loss but the level of anxiety and depression did not differ significantly among those 3 groups of patients. The results have shown that overweight and obese people have serious medical problems. They also differ in some psychological characteristics which have to be taken into consideration. Therefore, approach to these patients should be multidisciplinary, including dietary care, physical activity, psychological and medical care.

__Key words:__ obesity, anxiety, depression, body fat percentage

Introduction

Obesity refers to an excess of body fat, that normally accounts for about 25% of weight in women and 18% in men. Body fat can be measured by a number of methods but is usually estimated by the body mass index (BMI), which is calculated as weight in kilograms divided by height in meters^2 (kg/m^2)[1]. Many epidemiological studies define overweight as a BMI of 25–29.9 and obesity as a BMI equal or greater than a 30[2,3].

It is considered that nearly half a bilion of the world's population is considered to be overweight or obese. The problem does not affect only developed countries, as there is a significant increase in overweight and obesity throughout the developing world now. Obesity is relatively common in Europe. Current prevalence data from individual national studies collated by the International Obesity Task Force (IOTF) suggest that obesity ranges from 10 to 20% for men, and 10 to 25% for women[4].

In Croatia, the prevalence of obesity is rising rapidly. According to the last epidemiological study 79.2% of men and 49.9% of women are overweight and 31.1% of men and 15.2% of women are obese[5].

Available evidence indicates that higher levels of body weight and body fat are associated with an increased risk

for the development of numerous adverse health consequences. Obesity is a risk factor for chronic diseases such as hypertension, dyslipidaemia, type 2 diabetes, cardiovascular diseases, sleep apnoea, musculosceletal disorders and some cancers. Obesity can also lead to breathlessness, hyperuricaemia and gout, reproductive hormone abnormalities and foetal defects arising from maternal obesity. The risk of death from all causes, cardiovascular disease, cancer and other diseases, increases throughout the range from overweight to extremly obese, for both, men and women[6].

Many obese persons suffer from psychological problems specific to the obesity, including disparagement of the body image and binge eating. Dong *et al* found that extreme obesity was associated with the increased risk for the depression across gender groups, even after controlling for chronic physical disease, familial depression and demographic risk factors[7].

One model of motivational readiness that characterizes individuals throughout the process of change, from initial motivation, through relapse and to eventual success, is *transtheoretical model of behavior change*[8]. Readiness to change is embodied in the levels of the model's core construct, the stages of change. Transitions between the stages of change are effected by a lot of variables known as the process of change, and for weight control, these might include overweight percentage, body fat proportion, ideal weight, body mass index and caloric intake or energy expenditure[9–12].

The primary aim of this study was to compare behavioural and psychosocial characteristics in overweight and obese persons in order to identify the possible psychosocial consequences of obesity that may occur along with numerous medical problems associated with excess body weight.

The secondary aim was to compare medical parameters, known as metabolic risk factors for numerous diseases, between overweight and obese people. These parameters include serum glucose, cholesterol, triglycerides and high-density lipoprotein (HDL)-cholesterol, and also, blood pressure, pulse and body fat percentage.

Patients

In the study were included 307 participants. The sample consisted of 105 males and 202 females. The age range was 16–81 years (median 50). The average BMI was 33.1 ± 4.53. The sample consisted in 69% of married persons, 18% of unmarried, 4% of divorced and 9% of widows. There were 53% of employed participants, 31% of retired persons, 12% of unemployed and 4% of students. Demographic and basic body characteristics of patients included in the study were presented in Table 1.

The research took place at Outpatient Clinic for Internal Medicine at Clinical Hospital Centre Rijeka in the period of time from January 2004. to June 2005. Patients were included in the study if they visited a physician because of the obesity problems at least once in last 3 months.

Those patients whose body weight normalised (BMI< 25) through dieting, physical activity or medicament therapy during that period, were excluded from the study. Patients who didn't complete questionnaires according to the instructions were also excluded.

Final analysis, therefore, included 296 patients (103 males and 193 females, median age 50, range from 16 to 81).

Patients were divided in 3 groups depending on their BMI. Group I included 41 overweight patients (14%) with BMI ranging from 25 to 29.9. Group II included 170 patients (57 %) with BMI from 30 to 34.9 (obesity grade I). Group III included 85 patients (29%) with BMI $\geq$ 35 (obesity grade II and III).

Methods

Biochemical parameters were analysed in Clinical Hospital Centre Rijeka by biochemical analyser AU640 (Olympus, Japan). Serum glucose level was detected by UV hexokinase photometric method, triglycerides by gliacerophosphat-oxidase photometric method (GPO-PAP), cholesterol by cholesterol-oxidase photometric method (CHOD-PAP) and HDL cholesterol by direct immunoinhibitory method.

TABLE 1
AGE, WEIGHT, HEIGHT, GOAL WEIGHT, WAIST AND HIP CIRCUMFERENCE AND BODY FAT PERCENTAGE IN OUR PATIENTS

Patients characteristics	Males $\overline{X} \pm SD$	Females $\overline{X} \pm SD$	Total $\overline{X} \pm SD$
	(N=105)	(N=202)	(N=307)
Age [years] (median, range)	49 (16–78)	50 (16–81)	50 (16–81)
Weight (kg)	111.1 ± 18.6	89.3 ± 13.2	96.7 ± 18.4
Height (cm)	180 ± 8	166 ± 6	171 ± 10
Goal weight (kg)	89 ± 9	72 ± 10	78 ± 13
Waist circumf. (cm)	117 ± 14	104 ± 13	108 ± 15
Hip circumf. (cm)	117 ± 15	119 ± 10	118 ± 12
Body fat (%)	35.1 ± 7.3	41.3 ± 5.7	39.0 ± 7.0

Weight, height, waist and hip measurements were performed in Outpatient clinic in Clinical Hospital Centre Rijeka.

Body fat percentage was measured by Omron BF 302 analyser.

Psychological instruments

Participants were investigated using five self-report scales:

1. The University of Rhode Island Change Assessment Scale (URICA) consists of 32 items designed to measure four stages of change: *precontemplation, contemplation, action, and maintenance*[10]. There are eight items per scale, scored using a 5-point Likert type format. Higher scores indicate greater agreement with statements reflecting attitudes, cognitions, and affect associated with each stage of change. The range of possible total scores on each scale is 8 to 40. The primary purpose of the URICA is to identify specific stage profiles characteristic of transitions between the four basic stages of change or to identify subtypes of individuals within a stage of change. The instrument has a four-factor structure which was confirmed in this sample using principal axis factoring. We found internal consistency (Cronbach's alpha) coefficients of 0.80, 0.86, 0.89, and 0.82, respectively, for the precontemplation, contemplation, action, and maintenance.

2. The Decisional Balance Inventory (DBI) consists of 20 items designed to measure two hypothesized dimensions of decision making for weight control, the *pros* and *cons* of losing weight. The conceptual bases for the DBI are the decision-making model of Janis and Mann and the transtheoretical model. It is assumed that an individual's evaluation of the *pros* and *cons* of changing behaviour depends on motivational readiness to change[13].

The questionnaire consisted of two scales each containing 10 items scored using a 5-point Likert-type format. Participants were asked to rate the importance of each statement in influencing their decision on whether or not to lose weight. Higher score indicated assignment of greater importance. Coefficient alpha was 0.91 for the pros scale and 0.84 for the cons scales.

3. The Weight Efficacy Life-Style Questionnaire (WEL) consists of 20 items designed to measure five hypothesized dimensions of efficacy for weight management: availability, negative emotions, physical discomfort, positive activities, and social pressure. There are four items per scale, scored using a 10-point Likert-type format. Participants were asked to rate their confidence in resisting overeating in 20 tempting situations. Higher scores indicate greater confidence. Internal consistency Cronbach's alpha coefficients for the WEL were 0.93.

The conceptual basis of the WEL included the coping models of relapse and maintenance proposed by Shif-

fman and Bandura self-efficacy model, and the transtheoretical model. In this integrated model, efficacy was assumed to be related to motivational readiness to change, increasing linearly from precontemplation to maintenance[14].

4. The Beck Depression Inventory (BDI) was derived from observing and summarizing the typical attitudes and symptoms presented by depressed psychiatric patients and to reflect Beck's cognitive views on depression[15]. A total number of 21 symptoms were included; participants were requested to rate the intensity of these symptoms on a scale from 0 to 3. Typical questions relate to such areas as sense of failure, guilt feelings, irritability, sleep disturbance and loss of appetite. The internal consistency was 0.90 for this sample.

5. Spielberger´s Trait Anxiety Inventory (STAI) was used to measure anxiety as a personality trait[16]. It consisted of 20 items on 5-point Likert scale. The total score may range from 0 to 80 with higher score indicating higher level of anxiety. Cronbach alpha was 0.91.

Statistical methods

Data on BMI and other parameters were presented as average and standard deviation. For age we used median and range. We used one-way analysis of variance (ANOVA) to compare means between different groups, and post hoc Tuckey's test to evaluate differences among those groups.

Data were analyzed using statistical programs: Statistica 6.0 (Statsoft Inc, 1989-2002, Tulsa, USA) and SPSS 12.0 for Windows (SPSS Inc, 1989-2003, Diapache Software Foundation, LEAD Technologies, USA).

All p values =0.05 were considered statistically significant.

Results

Results for all examined laboratory and psychological parameters of patients included in the study are presented in Table 2.

Analyze of variance based on BMI as independent variable and medical and psychological parameters as dependent variables were conducted. Statistically significant difference among groups was shown in goal weight, systolic and diastolic blood pressure, body fat percentage, glucose and cholesterol serum level, but also in some psychological parameters like pros in decision making and in all four stages of change – precontemplation, contemplation, action and maintenance (Table 2).

To evaluate the differences among three groups of patients for those parameters which differed significantly on univariate analysis, Tukey's post hoc test was made.

The results of Tukey's post hoc test were as follows.

Statistical significant difference was found between goal weights in all three groups.

Systolic blood pressure was significantly different between group I and group III and between groups II and

TABLE 2
MEANS, STANDARD DEVIATIONS AND P VALUES (ANOVA TEST) OF EXAMINED MEDICAL AND PSYCHOLOGICAL PARAMETERS
FOR OVERWEIGHT (BMI 25–29.9) AND OBESE PATIENTS (BMI 30–34.9 – OBESITY GRADUS I, BMI≥35 – OBESITY GRADUS II AND III)
INCLUDED IN THE STUDY

Variable ± SD	BMI 25–29,9 $\overline{X} \pm$ SD	BMI 30–34,9 $\overline{X} \pm$ SD	BMI ≥35 $\overline{X} \pm$ SD	Statistics $\overline{X} \pm$ SD
	(N=41)	(N=170)	(N=85)	P
Medical parameters				
Goal weight (kg)	71 ± 12	76 ± 11	85 ± 13	<0.001*
Systolic blood pressure (mm Hg)	134 ± 10	136 ± 20	145 ± 23	0.003*
Diastolic blood pressure (mm Hg)	83 ± 7	86 ± 12	91 ± 14	0.006*
Puls (bpm)	77 ± 6	77 ± 10	80 ± 10	0.260
Body fat (%)	35.2 ± 6.6	37.7 ± 6.1	43.0 ± 5.4	<0.001*
stright Glucose (mmol/L)	5.85 ± 6.55	6.01 ± 1.78	6.74 ± 2.52	0.039*
Cholesterol (mmol/L)	5.12 ± 1.38	5.76 ± 1.27	6.00 ± 1.54	0.019*
Triglycerides (mmol/L)	1.88 ± 0.87	2.52 ± 1.80	2.62 ± 1.39	0.220
HDL (mmol/L)	1.40 ± 0.41	1.29 ± 0.33	1.32 ± 0.55	0.410
Psychological parameters (score)				
Anxiety	34.11 ± 15.05	32.89 ± 12.22	35.06 ± 14.14	0.480
Depression	10.59 ± 10.32	10.57 ± 9.34	11.18 ± 7.86	0.880
Pros of losing weight	32.21 ± 7.90	31.26 ± 7.68	34.34 ± 6.64	0.014*
Cons of losing weight	23.57 ± 7.23	24.08 ± 6.72	25.30 ± 7.57	0.380
Self-efficacy	115.53 ± 37.15	117.10 ± 36.71	114.89 ± 35.16	0.900
Precontemplation	19.27 ± 4.97	20.84 ± 6.07	18.39 ± 5.98	0.008*
Contemplation	29.21 ± 4.67	29.76 ± 6.40	32.61 ± 4.44	0.001*
Action	25.95 ± 5.33	25.79 ± 6.94	28.51 ± 5.88	0.008*
Maintenance	26.54 ± 5.05	26.75 ± 6.45	28.80 ± 5.01	0.027*

*significant *p* values, BMI – body mass index, HDL – high-density lipoprotein

III, while there was no difference found between groups I and II.

Results of systolic and diastolic blood pressure have shown statistically significant difference between group III and the other two groups.

Body fat percentage was significantly different between groups I and III, and also between groups II and III. There were no significant difference found between group I and group III.

Statistically significant difference was found between glucose plasma levels in group II and group III. Total cholesterol levels were significantly different between groups I and III, mean the differences between other groups were not statistically significant.

Individuals in group III showed the greatest difference in the pros of weight loss over the cons, which was significantly different that other two groups. In other words, extremely obese persons found more advantages over disadvantages of weight loss comparing to other two groups.

Statistically significant differences in the precontemplation scores were found between groups II and III. Those with higher BMI (group III) reported significantly higher scores in precontemplation stage comparing to the other two groups.

The significant differences were also found between group III and the other two groups in contemplation, action and maintenance scores. Patients with higher BMI showed higher scores on Contemplation, Action and Maintenance scales.

Discussion

In our study we have shown statistically significant difference among obese and overweight patients in goal weight, systolic and diastolic blood pressure, body fat percentage, glucose and cholesterol serum levels. People with higher BMI (>30) found more advantages (*pros*) over disadvantages (*cons*) of weight loss but the level of anxiety and depression did not differ significantly among three groups of overweight and obese patients.

The classifications of BMI recommended by both NIH and WHO, are using diagnostic cutoff points of 25 (for overweight) and 30 (for obese) but also small categories within obese (BMI 35 and 40) as additional cutoff points[17,18]. Because of a small number of patients with

BMI over 40 in the study, we unified them with the patients with BMI over 35 in the same group. Although some studies have shown that waist circumference indicates a larger burden of ill-health than BMI, because it correlates better with central fat distribution, we used BMI, the traditional measure used to identify those with a health risk from being overweight[19].

BMI range of 25 to 30 is not benign with respect to cardiovascular risk factors in both sexes and increases odds ratios for a wide range of important symptoms, especially in women[20,21]. Patients included in group I with BMI ranging from 25 to 30 had slightly elevated blood pressure (means of 134/83 mmHg), while other laboratory parameters were among normal ranges. Our study has shown significant difference in systolic and diastolic blood pressure values in patient with BMI over 35, comparing to patients in the other two groups. Body fat percentage and glucose level were also significantly higher in patients with BMI over 35. Cholesterol level was higher in patients with BMI over 35 comparing to those patients with BMI from 25 to 30. Levels of triglycerides were lower and levels of HDL higher in overweight patients (group I) compared to obese patients, but these results haven't reached statistical significance. Patients with higher BMI have more evident changes in blood pressure and laboratory parameters important for diabetes type 2 and cardiovascular risk[20,22]. Our results were similar to those and were starting point for analyzing psychological status of overweight and obese people.

Along with the numerous medical problems associated with excess weight, obesity is also associated with an enormous burden of physical, economic and emotional suffering[14]. Assessment of health risk should be complemented by an evaluation of psychosocial complications. For individuals faced with the task of losing weight, there are two main issues: losing the weight and maintaining the loss. In this respect, the problem of weight control is not very different from many other health problems that are refractory to change, such as smoking cessation or exercise adoption.

In the study the patients were asked about goal weight and they mostly had realistic goals. Goal weight was significantly higher in groups with higher BMI and only people from group I (overweight) had the idea to reach the normal body weight.

The challenge for researchers is to develop models of health behavior that can encompass the wide range of attitudes, cognitions, affect and activities that characterize individuals throughout process of change. An organizing principle that has been especially successful and popular is the notion of motivational readiness. One model of motivational readiness that has received considerable empirical support and was used in our study, is the transtheoretical model of behavior change[8,23], based on the notion of four stages of change: precontemplation, contemplation, action and maintenance. Precontemplation includes those who have no intention of losing or controlling weight in the next 6 months, and according to our results, patient with higher BMI, reported significantly

higher scores than other groups and were more ready to start losing weight. Contemplation is paradoxical stage of change, since the patient is open to the possibility of change but is stopped by ambivalence. The characteristic style of the contemplator is »yes, but …« For this reason contemplation generates anxiety and it is present in greater extent in patients with higher BMI. The action stage includes those who are not actively trying to lose or control weight but are seriously considering doing so in the next 6 months. In classifying individuals into the action stage, a minimum weight loss criterion is typically established as a goal. Maintenance is the stage of change in which person works hard to maintain and consolidate things acquired during the preceding phase, trying to prevent relapse and to accept new stile of life as permanent, developing a sense of self-control which can help to cope with future problem situations. Patients with higher BMI had higher scores than those with lower values of BMI in those two stages – action and maintenance. Maintenance is a stage critical for treatment, and the role of physicians and psychologists is to encourage obese persons to stay in this phase and resist possible appearance of relapse. According to the results we should propose that the persons with higher BMI were more open and ready to change.

Using the DBI we tried to assess two hypothesized dimensions of decision making for weight control, the *pros* and *cons* of losing weight. It is assumed, as it was notified before, that individual's evaluation of the *pros* and *cons* of losing weight depends on motivational readiness to change. In the study people with higher BMI (>30) found more advantages (*pros*) over disadvantages (*cons*) of weight loss. Evidence supporting the relationship between the *pros* and *cons* and the stages of change has been obtained across a wide range of problem behaviours[24].

Hypothesized dimensions of efficacy for weight management had been also measured. It showed how individuals coped with resisting overeating in various situations. All patients, with different BMI's, overweight and obese, showed the same confidence in resisting overeating.

Anxiety and depression were measured by BDI and STAI tests. There were no differences found among groups in these parameters. Although higher levels of anxiety and depression were expected in our patients, the results didn't differ from those published for healthy population[25,26].

Our results have confirmed that overweight and obese people have serious medical problems, but we were also focused on potential psychological changes in these people. We found that this group of people differ in some psychological characteristics that should be taken into consideration. It is important to recognize that people with higher BMI are more motivated to change. It is also important to know that levels of anxiety and depression do not differ significantly between overweight and obese patients and they do not show higher levels of depression and anxiety more than those published for healthy population.

Treatment of the metabolic, social and physiological aspects of obesity requires an integrated approach delivered by a multidisciplinary team comprising physicians, clinical psychologists, dieticians and exercise specialists[27,28]. Obesity programs need to include dietary care, physical activity, psychological/ behavioral care and medical care.

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PSIHOLOŠKI I MEDICINSKI PARAMETRI U PREKOMJERNO TEŠKIH I PRETILIH OSOBA

SAŽETAK

Cilj ove studije bio je analiza psiholoških karakteristika i medicinskih parametara u prekomjerno teških i pretilih osoba kako bi ustanovili moguće psihosocijalne posljedice debljine koje se mogu pojaviti uz brojne medicinske poremećaje vezane uz prekomjernu tjelesnu težinu. U ispitivanju je sudjelovalo 296 pacijenata (103 muškaraca, 193 žene, srednja dob 50 godina, raspon dobi od 16 do 81), koje smo podjelili u 3 grupe prema njihovom Indeksu tjelesne mase (ITM). Grupa I sadržavala je 41 pacijenata s ITM od 25 do 29,9, grupa II 170 pacijenata s ITM-om od 30 do 34,9, a grupa III 85 pacijenata s ITM≥35. Uspoređivali smo medicinske (glukoza, kolesterol, trigliceride i HDL u krvi, sistolički i dijastolički krvni tlak te postotak tjelesne masti) i psihološke parametre (depresija, anksioznost, prednosti i nedostatci gubitka težine, učinkovitost kontrole težine i 4 stadija promjene prema transteorijskom modelu promjene ponašanja) između navedene 3 grupe pacijenata. Univarijantnom analizom dobivene su statistički značajne razlike između prekomjerno teških i pretilih pacijenata u željenoj težini, sistoličkom i dijastoličkom krvnom tlaku, postotku tjelesne masti te razinama glukoze i kolesterola u krvi. Pacijenti s najvećim ITM-om (>30) prepoznali su više prednosti nego nedostataka gubitka tjelesne težine, dok se razine depresije i anksioznosti nisu značajno razlikovale među grupama ispitivanih. Dobiveni rezultati pokazuju da prekomjerno teške i pretile osobe pate od ozbiljnih medicinskih problema, kao i od određenih psiholoških poremećaja. Zbog toga smatramo da je takvim osobama potreban multidisciplinaran pristup koji uključuje pravilan pristup prehrani i tjelovježbi te medicinsku i psihološku pomoć.