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Why is it important to monitor the diet of overweight patients with depressive disorders?

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Summary

Introduction. Studies on the dietary habits of depressive patients demonstrate frequent deviation resulting in the development of many diseases.

Purpose. The aim of the study was to assess the efficacy of weight reduction diet in patients with depressive disorders, including the assessment of changes in the intake of major nutrients that may promote alterations in body composition during a three-month observation.

Methods. The study included 77 people with excessive body weight (45 women and 32 men; average age of women 49.3±10.3 years and men 47.1± 1.2 years) treated for recurrent depressive disorders and being on a 3-month weight reduction diet. The study patients underwent anthropometric measurements and their body composition was determined with electric bio-impedance.

Results. Mean weight loss in women was 2.7±2.5kg, and in men 2.0±5.6kg. There was a decrease in fat mass in women by an average of 1.8±5.7kg and in men by 1.3±7.1kg. A statistically significant reduction was reported in the mean waist circumference (3.8±3.7cm) and hips (2.0 ± 1.9cm) among women. Diet modification brought a decrease in the energy value of daily diet and reduction in the supply of macronutrients.

Conclusions. The long-term effect of the nutritional therapy indicates the need for intensified dietary education, both in terms of the number of dietary trainings and intensive cooperation between patient and dietician for proper selection of food products. The cooperation should not only be related to diet correction, but is also expected to motivate physical activity and lifestyle changes.

depression / diet / body composition

INTRODUCTION

A growing incidence of depressive disorders observed recently in the Polish and world population is a serious problem both for adults and the young, being a cause of early disability. It has been estimated that by 2020 depression will have been among the three main health problems worldwide [1]. Depression has been widely reported to be an independent predictor of cardiovascular diseases, including ischemic heart disease; it facilitates body weight gain and increases the percentage of overweight or obese subjects, especially those with abdominal obesity and accumulation of metabolically active visceral adipose tissue (VAT) [1–4].

Research shows that depressive patients with a BMI suggesting excessive body weight are more likely to engage both in pro-health and anti-health dietary behaviors as compared to those with a low BMI [5]. A link has been shown between obesity and depressive symptoms, and between obesity and depressive episode in the

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medical history [3]. Low self-esteem and lack of self-acceptance can cause elevated levels of stress and depression. On the other hand, chronic stress, depression and associated changes in dietary behaviors, such as consuming comfort food, may contribute to obesity development [6]

The study objective was to assess the efficacy of weight reduction diet in patients with depressive disorders, including the assessment of changes in the intake of major nutrients that may promote alterations in body composition during a three-month observation.

MATERIAL AND METHODS

The study was conducted among patients of Mental Health Outpatient Clinic attached to the Psychiatry Department, Medical University of Bialystok, from January to July 2013. The study involved 77 people with excessive body weight (45 women and 32 men, average age of women 49.3±10.3 years and men 47.1±11.2 years) (BMI ≥ 25 kg/m2), who declared willingness to reduce weight. The group included patients with the diagnosis of major depressive disorder (according to ICD-10) [7], lasting up to five years, with the current episode not longer than one month. Furthermore, the current treatment (≤ one month) consisted of one antidepressant (paroxetine, sertraline, citalopram, escitalopram, venlafaxine or mirtazapine) and one sedative used as needed. The history of present illness was assessed on the basis of data from the diet recall interview and from the available documentation. The Hamilton Depression Rating Scale (17-point version) and Beck's self-esteem scale [8,9] were used to rate the severity of depression. Patients participating in the study were informed about the objective and methodology. Each patient gave written consent to participate in the research. The study was approved by the local Bioethical Committee No. RI-002/325/2011. The study involved dietary assessment at the initial and final visit (after 3 months), anthropometric examinations (height, weight, waist and hip circumference) and analysis of body composition. For data collection, a questionnaire designed in the Department of Dietetics and Clinical Nutrition, Medical University of Bialystok was used. The questionnaire consisted of the demographic part and questions related to lifestyle, dietary habits and composition of daily food intake. When 7-day nutrition data were collected (at the first visit, before commencement of the dietary treatment), each patient received individual dietary advice and detailed information on the recommended low-energy diet (from 1200 to 1500 kcal for women and 1500 to 1800kcal for men). The patients were given written dietary recommendations in the form of a weekly plan developed for the specific energy value, with a household measures converter and caloric values of basic food products. They were also instructed how to determine portion sizes (according to "Photo album of products and dishes") [10]. Dietary habits were assessed every month based on the frequency of consumption, and required adjustments were made (including portion sizes). Nutritional behaviors were assessed based on weekly food intake diaries kept by patients before the final visit scheduled in the Department of Dietetics and Clinical Nutrition, Medical University of Bialystok (results were averaged). The Diet 5.0 computer program designed by the Food and Nutrition Institute in Warsaw was used to estimate the nutritional values of daily food rations, taking into account the loss of nutrients during culinary processing (Diet 5.0 package for planning and ongoing assessment of the individual diet. Institute of Food and Nutrition - license agreement No. HBBxtpINI) .

All patients underwent measurements of body weight (using electronic medical scales, to the nearest 0.1 kg) and height (with a rigid scale in medical weighing, to the nearest 0.5 cm) from which individual BMI values were calculated. Waist circumference was measured midway between the lower margin of the last rib and the superior iliac crest, and hip circumference at the level of trochanter major.

Body composition of patients (at the initial and final visit) was determined by the electric bioimpedance method using Maltron 920-2 BioScan analyzer (Maltron International LTD) following the recommended measurement conditions. Statistical analysis of the results used Statistica 10.0 (StatSoft), based on average values, standard deviations and percentage calculations. The Wilcoxon matched-pair test was applied to investi-

gate the significance of differences. The results were considered significant when $p<0.05$.

RESULTS

The study involved 77 patients suffering from recurrent depressive disorders. The mean disease duration was 4 years in 51% of the study women, 2-3 years in 22%, and less than one year in 27%. A single episode of depression affected 29% of women, 2-4 episodes were reported by 33%, and more than 4 episodes by 38%. For 25% of men, mean duration of the disease was 4 years, for 19% it was a period of 2-3 years, and for 56% it lasted less than one year. A single episode of depression affected 62% of men, 2-4 episodes were reported by 16% of men and more than 4 episodes by 22%. The average score in the Hamilton depression scale at baseline among the women was 14.6±6.7, whereas after 3 months of dietary therapy 13.8± 7.6 ($p = 0.8879$). In men, the initial score was 11.5±6.4, and after 3 months of dietary therapy 10.6±8.2 ($p = 0.7250$). Moreover, the average score obtained in the self-assessment Beck scale at baseline in women was 25.2±12.2, as compared to 19.1±11.9 ($p = 0.0457$) after 3 months. For men, initially it was 17 9±12.2 and after 3 months 14.0 ± 4.2 ($p = 0.5760$).

In the female group, 13% received paroxetine, 15% sertraline, 7% citalopram and escitalopram, 36% venlafaxine, and 22% mirtazapine. In the male group, 10% received paroxetine, 25% sertraline, 12% citalopram and escitalopram, 31% venlafaxine and 10% mirtazapine. In the female group, 16% had primary education, 29% vocational education, 42% secondary education, and 13% higher education. In the male group, 12% had primary education, 35% vocational education, 31% secondary education and 22% higher education. Most men (75%) and women (71%) were married.

Tables 1 and 2 (*on the next page*) show the effects of the 3-month application of low-energy diet. The average weight reduction in women was 2.7±2.5 kg, i.e. 3.3% of baseline body weight. BMI decreased from 30.2±3.2 to 29.8±3.1 kg/m2 (insignificant difference). After 3 months of dietary therapy both waist and hip circumference in women declined significantly by 3.8±3.7 cm and 2.0±1.9 cm, respectively.

The analysis of body composition showed fat reduction by 1.8kg on average. There was also a decrease in subcutaneous fat content by 17.9cm2 and in visceral adipose tissue by an average of 14.2cm2 (insignificant differences). Lean body mass decreased by 0.9kg (statistically insignificant). The percentage of body water and extracellular and intracellular water content increased only slightly over the 3 months (insignificant difference). The average weight reduction in men was 2±5.6 kg, i.e. 2.2% of baseline body weight. The mean BMI decreased from 28.3±2.9 to 27.6±2.6 kg/m2 (statistically insignificant difference). After the three-month dietary therapy a slight (statistically insignificant) decrease was noted both in the waist and hip circumference. The analysis of body composition showed fat reduction by 1.3 kg on average. A reduction was also observed in subcutaneous fat content (mean 5± 34.0 cm2) and in visceral adipose tissue (mean 37±347.0 cm2) (insignificant differences). Lean body mass increased by an average of 2.5kg (insignificant difference). The percentage of body water and extracellular water content increased marginally over the 3 months (insignificant). Tables 3 and 4 (*on page 51*) show changes in dietary energy content and in the composition of nutrients in daily food intake during the three-month dietary treatment. In women, a decrease was noted in the caloric value and in the intake of nutrients (statistically insignificant differences). There was a reduction in the percentage of energy from protein and fats in the food rations of women, and a rise in the percentage of energy from carbohydrates (statistically insignificant). In men, a reduction was observed in calorie intake and in the consumption of nutrients (statistically insignificant differences except for that of dietary cholesterol intake). Mean cholesterol intake decreased significantly from 339.0 ± 139.4 mg to 192.7 ± 68.9 mg. There was also a statistically insignificant change observed in the structure of dietary energy consumed by patients. A decrease was noted in the percentage of energy from fat, and an increase in the percentage of energy from carbohydrates and proteins, which may indicate frequent selection of low-fat protein products by men.

Table 1. Body weight, BMI, body composition in women before and after 3 months of diet

Variables	Women n=45			
	Before intervention Mean±SD	After intervention Mean±SD	Δ	p
Body weight (kg)	81.2±9.7	78.5±9.0	-2.7±2.5	0.2102
BMI (kg/m2)	30.2±3.2	29.8±3.1	-0.4±1.2	0.6529
Waist circumference (cm)	106.2±11.9	102.4±10.2	-3.8±3.7	0.0057
Hips circumference (cm)	112.9±7.0	110.9±6.1	-2.0±1.9	0.0442
Fat mass (kg)	32.4±6.0	30.6±7.7	-1.8±5.7	0.7583
Fat mass (%)	39.7±3.4	38.9±5.3	-0.8±5.2	0.7583
VAT(cm2)	334.8±257.8	320.6±323.6	-14.2±274.5	0.3318
SAT(cm2)	140.5±44.4	122.5±28.1	-17.9±44.8	0.0615
VAT/SAT	2.3±1.3	2.6±2.8	0.3±2.8	0.9057
Fat free mass (kg)	48.8±4.7	47.9±4.3	-0.9±1.9	0.4488
Fat free mass (%)	60.2±3.4	61.0±7.2	0.8±7.1	0.7583
Total body water (%)	47.5±2.2	48.0±2.9	0.5±3.4	0.9057
ECW (%)	44.6±7.9	46.6±0.9	2.0±8.3	0.1625
ICW (%)	53.3±1.6	53.4±0.9	0.06±1.5	0.6025
ECW/ICW	0.836±0.071	0.872±0.090	0.036±0.132	0.3701

Table 2. Body weight, BMI, body composition in men before and after 3 months of diet

Variables	Men n=32			
	Before intervention Mean±SD	After intervention Mean±SD	Δ	p
Body weight (kg)	90.7±12.4	88.7±11.3	-2.0±5.6	0.6335
BMI (kg/m2)	28.3±2.9	27.6±2.6	-0.7±1.8	0.0926
Waist circumference (cm)	101.8±9.4	100.9±8.0	-0.9±2.8	0.3139
Hips circumference (cm)	109.3±6.0	108.7±6.3	-0.6±5.3	0.6784
Fat mass (kg)	24.6±5.9	23.3±6.6	-1.3±7.1	0.7212
Fat mass (%)	27.8±4.8	26.2±6.2	-1.6±9.6	0.9593
VAT(cm2)	373.1±298.5	336.1±321.0	-37.0±346.0	0.7988
SAT(cm2)	119.2±31.6	114.1±47.5	-5.0±34.0	0.1394
VAT/SAT	3.1±2.3	2.6±2.0	-0.4±3.5	0.7988
Fat free mass (kg)	63.1±13.2	65.6±9.0	2.5±10.5	0.8784
Fat free mass (%)	72.1±4.8	73.9±6.2	1.8±9.6	0.9593
Total body water (%)	54.4±2.8	55.0±3.1	0.6±5.3	0.7988
ECW (%)	42.7±1.6	44.4±4.0	1.7±5.2	0.2621
ICW (%)	57.2±1.6	55.4±4.0	-1.7±5.2	0.2026
ECW/ICW	0.750±0.050	0.811±0.150	0.061±0.017	0.1354

Table 3. Nutritional value of daily food rations of studied women before and after low energy diet

Variables	Women n=45			
	Before intervention Mean±SD	After intervention Mean±SD	Δ	p
Energy (kcal)	1856.6±471.6	1570.8±415.2	-285.8±515.4	0.3087
Total protein (g)	68.0±19.5	54.0±16.3	-14.0±18.4	0.0758
Fat (g)	72.6±23.8	54.8±31.5	-17.8±38.5	0.5227
SFA (g)	38.1±13.4	23.5±14.6	-14.6±18.6	0.7583
MUFA (g)	26.9±10.1	24.8±10.4	-2.1±13.3	0.8313
PUFA (g)	7.6±4.3	6.5±4.1	-1.0±7.0	0.4924
Cholesterol (mg)	309.0±217.9	234.1±121.1	-74.8±249.3	0.4347
Carbohydrates(g)	251.0±76.1	215.7±79.8	-35.3±116.8	0.0615
% energy of protein	14.8±1.8	13.7±3.9	-1.1±4.4	0.7225
% energy of fat	34.6±7.6	31.3±10.3	-3.3±13.5	0.7945
% energy of carbohydrates	50.5±7.3	54.9±8.4	4.4±11.2	0.4347

Table 4. Nutritional value of daily food rations of studied men before and after low energy diet

Variables	Men n=32			
	Before intervention Mean±SD	After intervention Mean±SD	Δ	p
Energy (kcal)	2095.3±766.4	1599.8±470.5	-495.5±842.6	0.1097
Total protein (g)	72.8±20.4	59.5±17.6	-13.3±25.5	0.2603
Fat (g)	89.0±37.2	59.0±27.8	-30.0±39.2	0.1097
SFA (g)	38.6±16.5	28.2±11.4	-10.4±17.2	0.1386
MUFA (g)	35.0±15.0	24.8±11.9	-10.2±16.4	0.1386
PUFA (g)	8.9±5.2	6.5±4.2	-2.4±4.1	0.0858
Cholesterol (mg)	339.0±139.4	192.7±68.9	-146.2±177.0	0.0166
Carbohydrates(g)	267.8±99.6	207.5±75.9	-60.3±117.9	0.1386
% energy of protein	14.7±3.4	14.9±4.4	0.2±4.3	0.4412
% energy of fat	36.8±5.0	33.2±10.0	-3.6±7.1	0.3139
% energy of carbohydrates	48.2±5.2	51.9±9.8	3.7±8.1	0.5146

DISCUSSION

The current study aimed to assess the efficacy of low-energy diet in patients with depressive disorders for a period of three months, without supervised additional forms of physical activity. As research has shown, weight loss therapy may cause an increase in energy expenditure through greater consumption of energy substrates stored in adipose tissue, as a result of physical activity or dietary energy reduction or both these factors at the same time [11,12].

A change in the nutrition mode requires significant modifications of dietary habits, self-discipline and patient's cooperation with a dietician. In the current study, after 3 months, 60% of the study women showed a decrease in body weight, in 18% body weight remained unchanged and 22% demonstrated an increase in body weight. Among the study men, 53% showed a decrease in body weight, in 10% body weight remained unchanged, and in 37% an increase was noted during the three-month dietary therapy. As reported by Imayama, female patients treated with the reduction diet alone had mean weight loss of 7.2 kg (8.5% of initial body weight, $p < 0.01$), those who took only physical exercise lost 2 kg on average (aerobic exercise lasting 45min per day; 2.4% of initial body weight, $p = 0.03$), and patients treated with a combination of the reduction diet and physical activity lost 8.9 kg on average (10.8% of initial body weight, $p < 0.01$). However, 41.5% of women treated with diet alone, and 59.5% of women being both on diet and physical exercise obtained a 10% body weight reduction after 12 months of therapy [11]. In a study by Perez-Cornago, about 70% of patients reduced body weight. Those who followed the American Heart Association dietary guidelines (3-5 meals a day, with 55% of energy distribution from carbohydrates, 30% from fat, 15% from protein in overall dietary energy supply) lost 8 kg on average, and patients involved in the RESMENA project (30% reduction in diet caloricity) (7 meals a day, with 40% of energy distribution from carbohydrates, 30% from protein and 30% from fat in overall dietary energy supply) presented a 10 kg weight loss approximately, although the duration of the dietary treatment was six months [13]. In a study by Bouchard, the mean weight loss in patients included in the weight loss program was 1.81 kg, being lower than that obtained in the present study [2]. According to Bouchard, difficulty in body weight reduction despite the use of low-calorie diets may be due to genetic and epigenetic factors (e.g. reversible changes in the functioning of the genome regulating gene expression regardless of the DNA sequence). The use of low-calorie diet to reduce the risk of chronic diseases is very difficult in people whose genotypes prefer high calorie diet. Research has shown that 10-40% of the preference for macronutrients is under genetic control. However, this issue requires further research [2].

It is currently assumed that the aim of obesity treatment is to reduce body weight by 10% within 6 months and maintain it for a longer period of time [12]. However, literature reports suggest the possibility of effective body weight loss by reduction diet in less than 3 months [3, 14]. Somerset demonstrated greater weight loss (-2.29±4.3 kg) after 10 weeks of dietary therapy in female patients whose scores on the Beck Depression Inventory indicated a mild depression. In female patients with moderate to severe depression, a slight difference was noted between mean body weight before and after dietary therapy (0.2±1.2 kg) [14]. In a study conducted by Ruusunen et al., the reduction in body weight (on average by 3.51±5.9 kg) was accompanied by a decrease in depression symptoms (changes in scoring on the Beck scale, on average by -2.0±6.1 points) [4]. In the current study, the average score on the Beck scale decreased significantly only in female patients (from 25.2±12.2 to 19.1±11.9).

In the current study, after 3 months of treatment with a reduction diet, a statistically significant decrease was observed in the waist and hip circumference in the female patients. Bouchard reported even greater reduction in waist circumference after 6 months of dietary therapy, i.e. by 4 to 7 cm [2]. Such effect is beneficial as waist circumference is nowadays used to assess abdominal obesity; the greater the waist circumference, the higher the content of abdominal fat, which may lead to the metabolic syndrome and is associated with the risk of glucose intolerance, insulin resistance, diabetes, hypertension and dyslipidemia [3, 4, 13].

Several studies have shown that depression is associated with adipose tissue in the abdomi-

nal region, especially in women with overweight and obesity [6]. It has been found that a long-term effect of stress factors causing disturbances on the hypothalamic-pituitary-adrenal axis, primarily through an increased release of hypothalamic corticotropin (CRH, corticotropin-releasing hormone) and vasopressin (AVP, Vasopressin). Hypothalamic corticotropin and vasopressin act synergistically to potentiate the release of adrenocorticotropin (ACTH, a corticotropin hormone) and cortisol [15]. The consequence of neuroendocrine changes is an activation of lipoprotein lipase, which leads to lipid accumulation in adipocytes [16].

Research indicates that some pro-inflammatory cytokines, such as interleukin-6 (IL-6, interleukin-6) and C-reactive protein (CRP), can induce depression by direct activation of the hypothalamic-pituitary-adrenal axis [13, 15]. Some data indicate that unhealthy diet and lack of physical activity can stimulate the immune system, leading to increased secretion of IL-6 and CRP [13, 16].

According to literature data, the share of lean body mass in body weight reduction can oscillate from 15 to 25% [17]. One reason for the difficulty in determining the exact loss of lean body mass by bioelectrical impedance may result from the fact that this method, as an indirect assessment of body composition allows precise evaluation of body weight changes greater than 2-3 kg [17]. The range of changes in body weight in the study women was from -5 to 3 kg, and in men from -7 to 12kg.

Maintenance of a constant level in the total water content in the body is indispensable for its proper functioning and the aim of the weight loss process. In the study women, total water content increased on average by 0.5%, whereas in the male patients by an average of 0.6%. The extracellular water to intracellular water ratio can be a measure of the nutritional status of the body. The ratio can rise during fasting. Then, fat tissue mass, cellular mass and intracellular water are increased, whereas the extracellular water volume remains unchanged [2, 13, 17].

Moreover, obese people have a higher extracellular water content and a greater extracellular water to intracellular water ratio as compared to slim subjects [12, 18]. This condition can be explained by a greater extracellular water to intracellular water ratio, malnutrition, fluid metabolism disorders in obese individuals [12, 18]. In a study by Fogelholm, after 12 weeks of reduction diet in women, a slight reduction was found in the amount of intracellular water, and a small increase was noted in extracellular water compared to intracellular water [19].

It has been shown that the weight reduction process may encounter a number of difficulties and that its effectiveness largely depends on a number of factors, including the level of motivation and active participation of the patient [2, 4]. In the current study, a reduction was observed in the supply of energy and nutrients, although despite diet modification, with reduced energy and fat content, the obtained values exceeded those recommended in low energy diet.

The diet applied by patients was assessed basing on the analysis of seven days at the beginning and seven days at the end of the 3 months period of dietary treatment; the data were averaged. Thus, the results show permanent modification of dietary habits and not a one-day random choice with larger than average limitations. Averaging the data also reduces the possibility of adulteration by patients. Changes in the intake of the respective nutrients were accompanied by the improvement in the energetic structure of meals - increased percentage of energy from carbohydrates and reduced share of energy from dietary fats, which may indicate limited consumption of high fat products in favor of complex carbohydrates, which may also indicate a change in the attitude of patients in relation to the informed choice between products with favorable nutritional value.

Similar results have been obtained by other authors conducting dietary treatment among patients with depression [4, 13]. These authors have emphasized the effectiveness of high-protein diets (17% - 20% of energy value) even for more than six months. According to some authors, the intake of protein at 20% of dietary energy value may limit the loss of lean body mass during weight loss treatment, especially proteins that are the source of branched-chain amino acids playing a role in the regulation of glucose homeostasis [12, 13].

Another favorable aspect of diet modification recorded in the present study was the reduced dietary content of saturated fatty acids

(SFA), with a small decrease in the consumption of polyunsaturated and monounsaturated fatty acids. Data obtained by other authors show that food rations of people suffering from depression are often characterized by abnormal structure of fatty acid intake with excessive share of SFA [3]. Meanwhile, the correct supply of fatty acids, especially unsaturated fatty acids such as omega-3 acid EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) may have a beneficial effect in the treatment of depressive patients [20].

The differences demonstrated in the current study in the changes in dietary habits and nutritional status of women may arise not only from the need to reduce body weight for health promoting reasons, but also due to greater vulnerability of women to social pressure highlighting the importance of fitness for aesthetic reasons. In women, body weight is perceived not only as a measure of their health, but it is often treated as a measure of self-esteem and social acceptance.

The limitation of the study is heterogeneous antidepressant treatment, but the majority of patients were treated by selective serotonin reuptake inhibitors. Only 10 women (22%) and 3 men (10%) were treated by mirtazapine. It will be interesting to conduct study in the future with larger subgroups. Another limitation is not detected increased appetite in studied groups. In the research there is not a placebo group, because the main objective of the study was to assess the efficacy of weight reduction diet in patients only with depressive disorders.

CONCLUSIONS

1. Dietary treatment consisting in reduced energy values, mainly by reducing fat intake, contributes to weight loss.
2. The long-term effect of the nutritional therapy performed indicates the need for intensive dietary education, including more diet-related trainings and intensified cooperation between patient and dietician for correct selection of food products.
3. To achieve the most beneficial effects in the weight loss process in patients with depressive disorders, weight reduction programs should combine both diet modifications and increased motivation for physical activity.

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