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Assessment of dietary habits and nutritional status of depressive patients, depending on place of residence

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Abstract

Introduction and objectives. An increased incidence of depressive disorders observed in recent years in the Polish and world population is a serious health problem. The aim of the study was to compare dietary habits and nutritional status of patients with recurrent depressive disorders, depending on their place of residence. Their impact on selected metabolic parameters was also considered.

Materials and method. The study group comprised 96 women and 84 men reporting to the Outpatient Mental Health Clinic at the Department of Psychiatry, Medical University of Bialystok in north-eastern Poland. The average age of the women was 46.7±11.7 years, and of men 47.0±11.3 years. In the quantitative assessmentof diets, 24-hour food recall interviews were conducted. Assessment of the nutritional status of the respondents consisted of anthropometric measurements, body composition analysis and biochemical parameters.

Results. It was show that the diets of female urban inhabitants were characterized by a significantly lower energy value and total fat content, compared to their rural counterparts. The food rations of men living in the city had a significantly higher energy value, protein content and total FAT, compared to rural residents. It was also noted that urban residents of both genders were characterized by a lower percentage of body fat, both visceral and subcutaneous (women), and a higher water content than rural residents.

Conclusions. The study showed dietary errors in all compared groups, regardless of place of residence, which was reflected in the nutritional status of the respondents. The results also indicated that during the declared change in dietary habits, the treatment of depressive patients should include dietary instructions in order to ensure an optimum supply of nutrients.

Key words

dietary habits, depression, urban area, rural area

INTRODUCTION

Depression is a psychosomatic disorder, affecting more than 121million people worldwide [1]. The estimated number of adults suffering from depressive disorders in Poland amounts to 1.2–1.5million people. The disorder is more common in women than in men [2]. In the USA, depressive disorders affect 21.3% of women and 12.7% of men [1]. According to American research, about 20–30% of patients aged 18–54 years admitted by GPs display various depressive symptoms which increase significantly for those over 55 years of age[3].

The growing incidence of depressive disorders in the Polish and world population is a serious problem, both for adults and young people, and is one of the causes of early disability [2]. It has been estimated that by 2020, depression will be among the three main health problems worldwide [4]. In many studies, depression has appeared to be an independent predictor of cardiovascular diseases, including coronary heart disease, to facilitate body weight gain and increase the percentage of patients with overweight or obesity, especially abdominal obesity and accumulation of metabolically active visceral adipose tissue (VAT) [2, 5, 6, 7]. Depression has also been shown to occur in approximately 30% of patients with type 1 and type 2 diabetes [8].

As research shows, some socio-demographic factors (including age, education, marital status or place of residence) may differentiate the occurrence of depressive disorders [1, 4, 9, 10, 11]. However, the few studies that analyzed the incidence of depression depending on the place of residence have demonstrated ambiguous results. Peen et al. found that psychosomatic disorders, including depression, occurred more frequently in city patients; other researchers found a higher incidence of depression among residents of rural areas than the urban areas [4, 10].

OBJECTIVES

The aim of the study is to compare dietary habits and the nutritional status (as well as their impact on selected metabolic parameters) of patients with recurrent depressive disorder, depending on their place of residence.

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MATERIALS AND METHOD

The study group comprised 96 women and 84 men (48 female and 44 male residents of Bialystok in north-eastern Poland, and 48 female and 40 male rural residents) reporting to the Outpatient Mental Health Clinic at the Department of Psychiatry, Medical University of Bialystok in 2012–2013. The average age of female city inhabitants was 46.3±14.1 years, and of village residents 49.2±8.3 years. The average age of men living in the city was 45.4±10.9 and in the village 47.3±12.1 years. The study group included patients with the diagnosis of recurrent depressive disorders (ICD-10), lasting up to five years, with a current episode of depression not lasting longer than a month [12].

Furthermore, the current antidepressant treatment lasted no longer than one month, and consisted of one of the following drugs: paroxetine, sertraline, venlafaxine, citalopram, mirtazapine, escitalopram, and one sedative drug used in emergency. The disease course was assessed on the basis of medical history and available documentation. The Hamilton Depression Rating Scale (17-point version) and Beck Self-Esteem Scale [13, 14] were used to rate the severity of depression.

Patients who did not have any chronic metabolic diseases were enrolled to the study and informel about the purpose and methodology. Each patient gave written consent to participate. The studywas approved by the local Bioethics Committee (No. RI-002/325/2011).

Nutritional status. Assessment of the nutritional status of the respondents consisted of body weight measurement, height measurement, and Body Mass Index (BMI). Body composition analysis was performed by bioelectrical impedancje using a Maltron 920–2BioScan analyzer (MaltronInternational Ltd.). Measurements of body composition were carried out in the morning hours on an empty stomach, as recommended. Patients declared no consumption of coffee or Rother caffeinated products, strong tea, and alkohol for at least 24 hours prior to testing.

The percentage content of fat in the body (FM, fat mass), fat mass in kilograms, depth of subcutaneous adipose tissue area (SAT, Subcutaneous Fat), depth of fat in the visceral part (VAT, Visceral Fat), percentage of fat free body mass (FFM, fat free mass), lean tissue content expressed in kilograms, the percentage content of total body water (TBW), extracellularwater (ECW) and intracellular water (ICW) were assessed in the hospital laboratory. In terms of biochemical parameters of the nutritional status, the following were assessed: blood lipid profile (total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides), blood hemoglobin and glucose levels. The values obtained were referred to the currently applicable standards [15, 16].

Dietary intake assessment. Dietary data were collected using a questionnaire designer in the Department of Dietetics and Clinical Nutrition at the Medical University of Białystok. In the quantitative assessment of diets, 24-hour food recall interviews were conducted, including 3 weekdays and 1 weekend day, and the results were averaged. The assessed patients did not use any additional vitamin-mineral supplementation. Portion sizes of food products were estimated using the 'Photo Album of Food Products' elaborated in the Food and Nutrition Institute (IZZ) in Warsaw [17].

The nutritional value of daily food rations was analyzed using computer programme Diet5.0 (IZZ, Warsaw), taking into account the loss of nutrients during food processing The nutrition standards for the Polish population [18] were used to evaluate the compatibility of the selected nutrients with recommendations.

Statistical analysis. Performed Rusing Statistica10.0, StatSoftInc. Normal distribution of numerical variables was determined using the Shapiro-Wilk test. Student's t-test was used to compare variables in normal distribution; the non-parametric Mann-Whitney U test was applied for abnormal distribution. To assess the relationship between the nominal characteristics, the χ^2 test was used. Results were considered significant at $p < 0.05$.

RESULTS

Among the female respondents from urban areas, 45.8% had a single episode of depression, 16.7% of women reported 2–4 episodes and 37.5% more than 4 episodes. In the group of female village residents, 31.2% had a single episode of depression, 20.8% 2–4 episodes and 48% more than 4 episodes. In the group of male urban residents, a single episode of depression was reported by 59%, 2–4 episodes by 13.7%, and more than 4 episodes by27.3% of the patients. Among the male rural residents, 32.5% had a single episode of depression, 30.0% reported 2–4 episodes and 37.5% more than 4 episodes.

Table 1 shows the general characteristics of study patients. Female Urban residents had a significantly lower mean value of body weight (p=0,0047), waist circumference (p=0,0014) and BMI(p=0,0027), compared to their rural counterparts. No such differences were found among the men. The marital status turned out to be a significantly differentiating factor only in women (significantly more female urban residents with depression were unmarried or divorced, p=0,0128). According to the level of education, there were more respondents with primary education, both among men (p=0,0001) and women(p=0,0060), with depression living in villages, compared to those living inthe city.

Table 2 shows the selected parameters of the nutritional status of patients according to gender and place of residence. In the compared groups of women, fat content was significantly higher for women from rural areas than from city (p=0,0013). On the other hand, urban female residents had statistically higher fat free mass (%) (p=0,0023), total body water (%) (p=0,0031) and extracellular water (%) (p=0,0228) and ECW/ICW ratio (p=0,0386). Urban female residents were characterized by lower average visceral and subcutaneous adipose tissue content compared to their urban counterparts, although the differences were not statistically significant.

Male residents of the city were characterized by lower total body fat, visceral fat, intracellular water and higher content of fat free mass, subcutaneous fat, total body water and extracellular water content in comparison with village inhabitants (differences not statistically significant). In the two groups of women, despite lack of statistically significant differences, those from the city (with the exception of the average total cholesterol levels) were characterized by lipid parameters closest to current standards.

Table 1. General characteristics of respondents

Variables	Parameter	Women (n=96)		Men (n=84)	
		Urban (n=48)	Rural (n=48)	Urban (n=44)	Rural (n=40)
Body height (cm)	Mean±SD	163.4±6.1	162.9±5.5	177.3±7.6	174.2±4.2
	Median	163.3	164.0	179.0	173.0
Body weight (kg)	Mean±SD	65.9±11.6**	74.9±15.2**	89.8±13.5	86.3±13.6
	Median	65.5	76.0	87.5	90.0
Waist circumference (cm)	Mean±SD	89.1±12.1**	99.0±14.3**	102.2±8.9	102.8±9.7
	Median	91.0	100.5	102.0	107.0
Body mass index (kg/m^2)	Mean±SD	24.7±4.5**	28.2±5.2**	28.5±3.2	28.4±4.1
	Median	24.9	28.4	28.1	29.5
Body mass index					
Normal weight	(%)	50.0**	31.6**	4.6	17.5
Overweight	(%)	39.5	23.7	63.6	32.5
Obese	(%)	10.5	44.7	31.8	50.0
Marital status					
Single	(%)	21.1*	13.2*	22.7	17.5
Married	(%)	52.6	71.0	72.7	65.0
Divorced	(%)	23.7	2.6	4.6	17.5
Widow	(%)	2.6	13.2	0.0	0.0
Education					
Primary	(%)	18.4**	52.6**	36.4***	82.5***
Secondary	(%)	60.5	39.5	36.4	17.5
University	(%)	21.1	7.9	27.2	0.0
HAM-D score	Mean±SD	13.6±6.9	13.5±6.1	12.1±6.7	10.7±5.8
	Median	14.5	12.5	12.0	11.0
Beck score	Mean±SD	23.9±12.1	24.9±12.5	18.2±4.8	13.6±4.6
	Median	25.5	28.0	18.0	14.0

statistically significant differences within gender groups compared: * – <0.05; ** – p<0.01; *** – p<0.001

However, higher levels of total cholesterol (≥190 mg/dl) were reported in29.2% of female cityresidentsand42% of female villageinhabitants. Decreased levels ofHDL-cholesterol (≤50mg/dL) appeared in39.6% of city women and60.4% of those from countryside.Higher levels ofLDL-cholesterol (>115 mg/dl)were noted in58.3% of urban women and69% of village women.Among the female residents, assessment of glycaemia on an empty stomach showed higherglucose levels (≥100 mg/dl) in35% of women from the city and in 47.9% of those from countryside.It was also shownthatreduced levels of blood hemoglobin (<12g/dl) occurred in 16.7% of women from the city and8.3% of women from countryside.Significantlyhigher levels oftriglyceridesin blood serum (p=0,0084) were demonstrated by city male inhabitantsas comparedto male villagers(elevated levels oftriglycerideswere found in63.6% of the urban and in 40% of the rural population).

At the same time, elevated levels oftotal cholesterol were reported innearly 70% of men in both study groups. Decreased levels ofHDL-cholesterol (≤40 mg/dl)were noted in36.4% of urban and in 40% of rural residents. Elevated levels ofLDL-cholesterol were present inapproximately 60% of patients in both male groups.In addition,elevatedglucose valueswere recordedin47.7% of men from the city, and 62.5% of men from the village. It was also shownthatreduced levels ofhemoglobin in the blood(<14g/dl) occurred in 13.6% of men fromthe city, and 10% of men from the village.

Table 3 shows mean energy value in daily food rations and average intake of main nutrients by patients. In the study groups of women, statistically significant differences

Table 2. Chosen parameters of nutritional status of patients according to gender and place of residence

Variables	Parameter	Women (n=96)		Men (n=84)	
		Urban (n=48)	Rural (n=48)	Urban (n=44)	Rural (n=40)
Fat mass (FM) (%)	Mean±SD	30.3±9.3	37.2±8.1	29.0±5.0	31.2±8.2
	Median	31.9**	39.3**	28.7	30.7
Fat mass (kg)	Mean±SD	21.1±9.3	28.9±10.7	25.9±6.6	27.7±9.7
	Median	21.9**	30.5**	24.8	27.8
Fat free mass (FFM) (%)	Mean±SD	69.5±9.4	62.8±8.1	70.9±5.0	68.7±8.2
	Median	67.1**	60.7**	70.3	69.2
Fat free mass (kg)	Mean±SD	45.1±4.1	46.4±5.7	62.5±11.1	58.4±5.7
	Median	45.5	46.2	63.9	59.3
Visceral fat (VAT) (cm^2)	Mean±SD	244.5±206.3	275.7±219.2	394.3±328.4	435.5±417.3
	Median	174.0	208.0	260.5	195.0
Subcutaneous fat (SAT) (cm^2)	Mean±SD	105.3±33.8	124.2±44.5	127.3±56.5	124.4±36.7
	Median	89.0	118.5	112.0	104.5
VAT/SAT	Mean±SD	2.3±1.7	2.1±1.3	3.2±2.673	3.4±3.8
	Median	1.7	1.7	2.210	1.950
Total body water (TBW)(%)	Mean±SD	52.0±5.2	48.7±5.5	53.1±3.2	51.5±4.3
	Median	51.0**	47.6**	53.2	51.8
Extracellular water (ECW) (%)	Mean±SD	48.3±3.8	45.7±5.7	43.1±2.1	42.5±1.4
	Median	47.8*	46.7*	42.8	43.3
Intracellular water (ICW) (%)	Mean±SD	51.7±3.9	53.3±2.3	56.8±2.1	57.4±1.4
	Median	52.2	53.1	57.1	56.7
ECW/ICW	Mean±SD	0.94±0.2	0.87±0.07	0.76±0.06	0.74±0.04
	Median	0.91*	0.88*	0.750	0.763
Total cholesterol (mg/dl)	Mean±SD	216.1±50.5	207.4±34.9	220.6±34.6	213.0±47.0
	Median	197.5	204	212.0	226.0
HDL-cholesterol (mg/dl)	Mean±SD	55.8±11.9	52.6±13.2	46.7±10.8	39.8±4.4
	Median	57.0	52.0	42.0	38.0
LDL-cholesterol (mg/dl)	Mean±SD	124.8±41.1	127.7±30.6	134.4±38.3	147.2±47.4
	Median	121.0	127.0	135.5	157.0
Triglycerides (mg/dl)	Mean±SD	131.2±100.6	135.1±84.6	197.1±103.1	132.5±17.5
	Median	104.5	103.0	180.0**	138.0**
Glucose (mg/dl)	Mean±SD	103.6±13.8	106.5±11.9	102.1±14.1	106.0±15.3
	Median	101.0	107.5	100.0	105.0
Haemoglobin (g/dl)	Mean±SD	13.2±1.48	13.2±1.1	14.6±0.8	14.4±1.4
	Median	13.7	13.4	14.6	14.9

statistically significant differences within gender groups compared: * – <0.05; ** – p<0.01; *** – p<0.001

were demonstrated in supply of energy (p=0,0271), total fat (p=0,0294) and saturated fatty acids (p=0,0413), where the intake was significantly lower in city residents as compared to rural inhabitants.

Men demonstrated statistically significant differences in the supply of energy (p=0,0212), total protein (p=0.0019) and total fat (p=0,0180), whose intake was significantly higher in the urban population compared to the rural one.

Table 3. Average energy value and consumption of selected nutrients in the groups of patients compared by gender and place of residence

Variables	Parameter	Women (n=96)		Men (n=84)	
		Urban (n=48)	Rural (n=48)	Urban (n=44)	Rural (n= 40)
Energy (kcal/day) [% norm]	Mean±SD	1497.2± 646.4 [80.9]	1718.0± 497.4 [92.8]	2069.4± 676.6 [84.5]	1691.3± 511.7 [69]
	Median	1308.2* [70.7]	1690.4* [91.3]	1925.0* [78.6]	1629.2* [66.4]
Total protein (g/day) [% norm]	Mean±SD	59.8±26.6 [130]	64.9±20.4 [141]	74.5±24.7 [122]	59.3±11.9 [97.2]
	Median	53.0 [115]	62.1 [135]	70.9** [116]	54.8** [89.8]
Total fat (g/day) [% norm]	Mean±SD [% norm]	51.5±28.0 [83]	63.1±25.5 [101.8]	84.6±36.8 [103.7]	66.7±29.5 [81.7]
	Median	44.1* [71]	60.2* [97.1]	76.2* [93.4]	56.9* [69.7]
Saturated fatty acids (SFA) (g/day) [% norm]	Mean±SD	21.5±11.4 [131]	27.2±13.6 [165.8]	38.1±17.7 [174.8]	29.1±13.5 [133.5]
	Median	19.5* [119]	26.0* [158.5]	34.2 [156.9]	25.8 [118.3]
Monounsaturated fatty acids (MUFA) (g/day) [% norm]	Mean±SD	20.1±12.0 [65.2]	24.4±10.5 [79.2]	32.5±14.4 [79.6]	26.6±12.1 [65.2]
	Median	17.0 [55.2]	22.7 [73.7]	29.3 [72]	23.5 [57.6]
Polyunsaturated fatty acids (PUFA) (g/day) [% norm]	Mean±SD	6.2±5.1 [43]	5.9±2.9 [50]	7.4±4.0 [38.9]	5.6±2.3 [29.5]
	Median	4.4 [30.5]	5.4 [37.5]	6.4 [33.7]	4.9 [25.8]
Cholesterol (mg/day) [% norm]	Mean±SD	207.2±68.3 [69]	263.8±186.5 [88]	323.8±189.7 [108]	201.7±77.3 [67]
	Median	154.7 [51.5]	192.7 [65.7]	265.6 [88.5]	190.1 [63.4]
Carbohydrates (g/day) [% norm]	Mean±SD	212.6± 88,2 [76.6]	239.6± 73.7 [86.3]	269.3± 87.2 [73.3]	210.5± 71.4 [57.3]
	Median	193.6 [69.8]	227.3 [81.9]	255.0 [69.4]	189.2 [51.5]
Fiber g/day) [% norm]	Mean±SD	16.0±5.3 [53.3]	18.1±8.3 [60.3]	18.8±6.3 [62.6]	13.5±6.2 [45]
	Median	15.1 [50.3]	16.8 [56]	18.9 [63]	11.3 [37.7]
Protein (% E)	Mean±SD	16.5±3.3	15.1±2.6	15.1±3.9	15.1±3.7
	Median	16.0*	14.5*	14.3	14.9
Total Fat (% E)	Mean±SD	29.4±7.0	32.1±8.4	35.1±7.0	34.8±7.3
	Median	28.6	32.4	37.0	36.9
Carbohydrates (% E)	Mean±SD	54.0±7.1	52.7±7.4	49.7±7.0	48.8±7.6
	Median	54.0	53.5	49.9	50.2

statistically significant differences within gender groups compared: * – <0.05; ** – p<0.01; *** – p<0.001
% E – percentage of energy

DISCUSSION

The increasing incidence of depressive disorders is an important social, economic and health issue, lowering the quality of life and worsening or limiting functioning of individuals.

Many studies have shown that social problems, external environment stressors, are more common in cities than rural areas. High population density urban areas are characterized by high rates of crime, mortality, social isolation, environmental pollution and noise [9, 10, 19]. Research shows that more than half of the world population today live in urban areas, and demographic forecasts predictits continuous growth to more than 6.3 billion by 2050 [19]. In Poland, 61% of people live in urbanized areas and the number is still increasing [2].

According to the available literature, depression can lead to negative life style behaviors (avoiding physical exercise), eating disorders including anorexia, bulimia, night eating syndrome [20]. Studies have shown that people with depression may display reduced, unchanged or increased appetite. It has been noted that the weight gain due to increased appetite and decreased physical activity occurs in approximately 40%, whereas body weight reduction in 30% of patients with depression [20].

Other researchers emphasize that dietary habits of patients suffering from depression are frequently characterized by improper proportions in the intake of respective nutrients. The most common errors reported include eating foods with high glycemic index, incorrect diet composition in terms of fatty acids, macro- and micronutrients, abnormal relationship between Na/K and too low fiber content [20, 21, 22]. Our assessment of dietary intake of energy and essential components also revealed many irregularities.

In our study, women in both groups failed to meet dietary recommendations for the majority of nutrients, except for total protein and saturated fatty acids, which were consumed in excess. However, meansupply of most nutrients was higher in the food rations of rural women. In men, food rations of the urban population had higher nutrient content, although both groups were characterized by too low supply of fatty acids, both monounsaturated and polyunsaturated, and too high supply of saturated fatty acids.

Data obtained by other authors show that food rations consumed by people suffering from depression are often characterized by improper structure of fatty acids, with excessive share of SFA [21]. However, proper supply of fatty acids, especially the omega-3 unsaturated fatty acids, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic), may have a beneficial effect on the treatment of depressive patients. High consumption of fish as a source of unsaturated fatty acids has been found to correlate with the low percentage of patients with mental disorders in the population [20].

It has been shown that daily intake of omega-3 fatty acids (1–2 g) is sufficient for healthy people, whereas their supply amounting up to 9.6 g appears safe and sufficient for patients with psychiatric disorders [22]. The antidepressant effect of EPA may be due to possible conversion to prostaglandins, leukotrienes and other compounds required for normal brain function. According to another theory, EPA and DHA influence signal transduction in brain cells through activation of PPAR receptors, inhibition of G-protein and of protein kinase C [20, 21].

In the current study, the share of energy derived from the consumption of essential nutrients was found to deviate from the recommended standards in all the study groups. In a balanced food ration, protein-derived energy should not exceed 10–15%, fat-derived energy should be lower than 30% and carbohydrate-derived energy should not be less

than 55% [18]. We demonstrated too high share of energy from fat (except for urban female residents), and very low from carbohydrates. Similar results were obtained by other authors, where the percentage of protein energy exceeded 17%, fats-derived energy was over 30%, and carbohydrate energy was lower than 50% [21]. Dietary habits of patients influenced their nutritional status.

In the present study, the nutritional status of patients was assessed by means of anthropometric measurements, body composition measurements and biochemical examinations. Body weight as a basic parameter for energy-protein nutritional status is one of the most important prognostic factors in the course of many diseases. Obesity is a known risk factor not only for depression, but also cardiovascular disease; it promotes development of carbohydrate and lipid disorders, and hypertension.

In our study, the average body mass index differed significantly only in women, and was statistically significantly lower for urban residents, with 50% of the subjects having normal BMI. In the remaining groups, the percentage of excessive body weight was found in 70% of female rural inhabitants and in over 80% in the male groups. Other authors have also demonstrated a significant percentage of depressive patients with BMI exceeding 25kg/m^2 [5, 23, 24, 25].

It has been shown that depressivesymptomsandBMIare inverselycorrelated with each other, thus indicating agreaterprotectiveshare of physiological, functional and psychological factors as compared to the amountof muscle massand increasedphysical activity. This wasreflected in Ahmadi's research, inwhich patientswith depression were characterized by an increased thickness of skinfolds and total body fat [23].

Waist circumferenceexceeding80 cmin womenand 94 cm in men (abdominalfat distribution) is an alarming trend observedin this study[15]. Waist circumferenceconfirming the accumulation of visceral fatin female patientswith depression(> 90cm) has also been reported by otherauthors [5, 25]. In the present study, the averagefat content was lowerin female and male urban residents (30% and29%, respectively) compared to female and male village inhabitants (37% and 30%, respectively), although statistically significant difference was found onlybetween women.

Other authors reported higherbody fat massinwomen(above 38%) and lower in men (27%) than those obtained in the present study [24, 25]. The analysis of bodycomposition includedthe content ofvisceral adipose tissue andsubcutaneousadipose tissue. Althoughthere were nostatistically significant differencesbetween the comparedgroups, it was demonstratedthatVAT values in men and womenfrom the city were lowerthanin those from rural areas. The content ofSATwasat a similar levelin both gender groups.

Other authors reported lower average VAT (94.6 cm^2) and a higher proportion of SAT (389.5 cm^2) in comparison with those found in the present study [5]. In patients with depression, waist circumference was strongly correlated with both subcutaneous, r = 0.83 and visceral adipose tissue, r = 0.77, p <0,001) [5]. It has been demonstrated that visceral adipose tissue is metabolically active, associated with the secretion of pro-inflammatory factors (Interleukin 6, IL-6), tumor necrosis factor α (TNFα), adipocytokines, hemostasis and fibrinolysis markers (including plasminogen activator inhibitor-1, PAI-1) and growth factors (vascular endothelial growth factor, VEGF). The increase in intra-abdominaladipose tissue in patients with depression may be associated with a greater risk for cardiovascular diseaseand diabetes [5, 15]. Everson-Rose et al. showed that postmenopausal women, whose body fat exceeded 163cm^2 were 4 to 5times more likely to have an adverselipidprofile (low HDL-cholesterol, hypertriglyceridemia, high ratio of LDL to HDL-cholesterol, hyperinsulinemia) [5]

In the current study, selected lipid parameters (total cholesterol, HDL-cholesterol, LDL-cholesterol) and blood glucose levels were consistent with the recommended standards in most male and female patients living in the city as opposed to the rural population. However, a considerable percentage of patients with abnormal lipid and carbohydrate parameters in all the study groups, together with persisting improper dietary habits, indicates a risk of metabolic diseases in the future.

CONCLUSIONS

The current study indicates abnormal eating habits of patients with depression, regardless of place of residence, coexisting with overweight and obesity. Food rations of patients were characterized by nutritional imbalance, especially by high supply of protein and saturated fatty acids. Residents of rural areas compared to urban residents had higher body weight, BMI, total body fat and a higher proportion of visceraladipose tissue. A larger percentage of rural than urban residents were characterized by disturbances in lipid and carbohydrate metabolism.

Improvement indietary habits, especially balanced intake of fatty acids, increased supply of mono- and polyunsaturated fatty acids and fiber, and reduced supply of protein products and saturated fatty acids can be beneficial for maintenance of good health. Proper health education, including the optimum selection of food products is necessary for patients with depression, especially from rural areas.

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