

1. SUMMARY

In recent years, the increase in incidence of mental disorders, such as depression and schizophrenia, has been observed. The World Health Organization (WHO) predicts that these diseases will dominate among other civilization diseases in 2020. Annual morbidity of schizophrenia is estimated at 7-40/100,000 people, and the risk of illness in the general population during the whole life in all countries is similar – about 1%. In Poland, it is estimated that about 400,000 people suffer from schizophrenia. The etiology of depressive symptoms and syndromes is multifactorial and includes genetic predisposition, physical state of the body and stress factors. Schizophrenia is a chronic disease with a multifactorial etiology. Currently, the role of genetic, biochemical, viral, neurophysiological and neuropathological factors is considered in the etiopathogenesis of schizophrenia. The relationship between nutraceutical and a mental state has been reported for a long time.

These bioactive food components which, due to their properties, have an strengthening activity on body functions and determinate the proper activity of nervous system. These include, for example, amino acids (tryptophan, tyrosine, phenylalanine), dietary fiber, polyunsaturated fatty acids such as eicosapentaenoic and docosahexaenoic, vitamins such as vitamin C, β -carotene, vitamin D, vitamin E, folic acid, choline, vitamin B1, vitamin B6, vitamin B12 and minerals: calcium, magnesium, sodium, potassium, iron, zinc, copper, selenium and iodine.

The aim of the study was to assess the impact of nutraceutical supply, diet and nutritional status on the mental state of patients with depression and schizophrenia. The specific objectives included:

1. Analysis of relationship between the diet and mental state of patients with depression and schizophrenia.
2. Evaluation of nutraceutical supply and mental state of patients with depression.
3. Evaluation of nutraceutical supply and mental state of patients with schizophrenia.
4. The effect of nutrition on the clinical condition of patients with depression and schizophrenia.
5. Evaluation of the influence of the clinical state on selected biochemical parameters of blood of patients with depression and schizophrenia.
6. Evaluation of the influence of the clinical state on selected biochemical blood parameters of patients with depression and schizophrenia.

The study involved 376 people, including 156 patients with depression (109 women and 47 men) and 116 patients with schizophrenia (53 women and 63 men), aged 18-65 years,

treated in the Department of Psychiatry of the Medical University in Białystok and 104 healthy volunteers (62 women and 42 men) applying to the Department of Dietetics and Clinical Nutrition of the Medical University of Białystok in order to evaluate the nutrition and nutritional status (the study was conducted in 2012-2016).

Patients diagnosed with recurrent depressive disorder and schizophrenia (according to ICD-10 criteria) were included in the study group. The course of the disease was assessed basing on the data from the interview and available medical documentation. The assessment of the severity of depression was made using the Hamilton Depression Scale (17-point version), the average number of episodes per year of the disease and the duration of the disease. The course of schizophrenia was assessed basing on the average age of illness, the number of episodes and the duration of the disease (information obtained from the medical history). The control group consisted of healthy people without mental disorders, eating disorders and chronic diseases related to the metabolism of nutrients (matched in terms of age, sex and nutrition status).

Each person was interviewed at the preliminary visit – a standardized questionnaire which contains a sociodemographic part, a qualitative assessment of diet, a quantitative assessment of the usual diet (24-hour interview concerned the most frequently consumed products and meals recently) was prepared at the Department of Nutrition and Clinical Nutrition, UMB. To assess the supply of nutraceuticals such as amino acids (tryptophan, tyrosine, phenylalanine), polyunsaturated fatty acids (eicosapentaenoic and docosahexaenoic), vitamins (vitamin C, β -carotene, vitamin D, vitamin E, folic acid, choline, vitamin B1, vitamin B6, vitamin B12) and minerals (calcium, magnesium, sodium, potassium, iron, zinc, copper, selenium, iodine) the computer program Diet 5.0 developed by the National Food and Nutrition Institute in Warsaw was used. The database developed by the United States Department of Agriculture Agricultural Service USDA (Food Composition Databases) was used (no data on the content of selenium and choline in Polish databases).

Subsequently, the body weight and height of the each patients were measured (BMI [kg/m²] was calculated individually) and then the waist and hip circumferences were measured (the WHR (waist/hip ratio) was determined individually). Next, each patient was analyzed by the bioelectronimpedance method using the Maltron BioScan 920-2 (Maltron International LTD). Patients were assessed for biochemical parameters (total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, fasting glucose and electrolytes, sodium and potassium (data were obtained from the medical history). Analyzing the diet of patients of the

three study groups, it was found that it was characterized by too low energy value, inadequate supply of digestible carbohydrates and dietary fiber.

Among men with depression, together with the severity of the disease, there was a tendency to reduce the supply of digestible carbohydrates. In addition, in the group of men with depression, a statistically significant average negative correlation was found between the supply of dietary fiber and the number of episodes per year of the disease.

Eicosapentaenoic and docosahexaenoic acid was consumed below the recommended standard by approximately 90% of examined women and men with depression and schizophrenia. In the group of women with depression, it was observed that the supply of eicosapentaenoic acid in daily food ration showed a positive correlation with the number of episodes per year of the disease, but this relationship was not statistically significant.

In the daily food rations of women and men with depression and schizophrenia, deficiencies in the supply of vitamin D, vitamin E, vitamin C, folic acid and choline were found. In addition, it was found that deficiencies of these vitamins were more frequent in women with depression than in women with schizophrenia, while in men, these deficiencies were more frequent in the group with schizophrenia. In the group of women with schizophrenia, a statistically significant weak correlation was observed between the supply of choline and the number of episodes per year of the disease. In the group of men with depression and schizophrenia, a statistically significant weak negative correlation was found between the supply of vitamin C and the duration of the disease. In addition, in the group of men with schizophrenia a statistically significant weak negative correlation was found between the supply of folic acid and the number of episodes of the disease. However, in the group of men and women with depression, a tendency to reduce the consumption of folic acid with the duration of the disease was observed.

In the daily food rations of patients with depression and schizophrenia, too low supply of calcium, magnesium, potassium, iron and iodine was found, at the same time it was observed that these deficiencies were more frequent in the group of women with depression than with schizophrenia. Whereas, in men, these deficiencies were observed more frequently in the group with schizophrenia than in group with depression. Assessing the supply of nutraceuticals and the psychological state of the examined patients, a statistically significant weak negative correlation between the supply of calcium and the duration of the disease was found in the group of women with depression. In the group of women with schizophrenia, a statistically significant weak negative correlation between the selenium supply and the number of episodes and the duration of the disease was noted. In the group of men with

depression, a statistically significant weak negative correlation was found between the magnesium supply and the number of episodes of the disease. Also in the group of men with depression, a statistically significant strong negative correlation was found between the potassium supply in daily food ration and the number of episodes. In addition, among men with depression, a statistically significant average correlation between the iodine supply in daily food ration and the severity of the disease and the statistically significant average correlation between the zinc supply and the intensification of depression were noted.

In the multivariate analysis, it was found that the factor significantly affecting the clinical condition of depression (assessed by the Hamilton Depression Scale) was choline. However, tyrosine, vitamin B1, folic acid, magnesium and copper proved to be the factors that significantly contributed to the decrease in the number of episodes of schizophrenia. However, the consumption of phenylalanine in daily food ration was a factor significantly influencing the increase in the number of schizophrenic episodes in the examined patients.

Assessing the nutritional status and clinical (mental) state, a statistically significant average positive correlation between the BMI index (kg/m²) and the duration of the disease was found in the group of women with depression. Among women and men with depression, a statistically significant positive correlation between the waist/hip ratio (WHR) and the duration of the disease was also noted. Also in the group of women with depression a statistically significant mean positive correlation between the body fat content and the severity of depression as well as the statistically weak positive correlation between visceral adipose tissue and the duration of the disease in the years were found. At the same time, in the group of women with depression a statistically significant weak positive correlation between the ratio of visceral to subcutaneous adipose tissue (VAT/SAT) and the severity of depression was observed. However, among women with schizophrenia, a statistically significant weak negative relationship between the value of the VAT/SAT ratio and the number of disease episodes was noted, whereas in the group of men with schizophrenia a statistically significant average correlation between the value of the VAT/SAT ratio and the duration of the disease was found.

Analyzing the biochemical blood parameters and the mental state of the examined patients, a statistically significant average negative correlation was found between the concentration of sodium ions (Na⁺ [mmol/l]) and the severity of depression in women. However, in the group of men with depression, a statistically significant weak negative correlation between LDL cholesterol concentration and the number of disease episodes and a statistically significant average positive correlation between serum LDL cholesterol

concentration and duration of the disease were found. Whereas, among women with schizophrenia, a tendency to lower serum glucose concentration with the increase in the number of episodes and the duration of the disease was found.

In the care of mentally ill patients, it is important to monitor the anthropometric parameters supported by educational activities in the area of caring about health. An essential supplement to these activities should also be increased nutritional education, control of the nutrient supply in the diet and their serum concentration. And in a situation where the patient is not able to balance his diet, the supplementing it with appropriate preparations should be consider.