SUMMARY

Alzheimer's disease (AD) is a progressive, incurable neurodegenerative disease, which is considered to be the most common form of dementia in the elderly. The main mechanism of AD pathology is the deposition of A β peptide forms in the brain resulting in neuronal death and the development of clinical symptoms of dementia. Amyloidosis is then followed by increased levels of oxidative stress, chronic inflammatory response, disturbances in homeostasis of elemental metabolism, formation of pathological ion channels or changes in the transmission of neurotransmitters. Due to the fact that the pharmaceuticals used in Alzheimer's disease work only symptomatically, it seems advisable to look for other methods, including dietary interventions aimed at improving the quality of patients' lives.

The aim of the study was to assess the correlation between the total antioxidant status (TAS), the concentration of selected elements (Mg, Se, Zn, Cu, Cd, Pb) in the blood, nutritional and environmental factors, and the clinical condition of people with Alzheimer's disease. Moreover, the diet of AD patients was assessed, in particular the concentration of selected elements in the patients' blood was compared with their levels in healthy people. The examination also involved the antioxidant status of AD patients in comparison to healthy people as well as the dependence of the concentration of selected elements and TAS in people with AD on their dietary habits. Correlations between the clinical condition and the severity of dementia along with the biochemical parameters were the scope of investigation.

The study involved 170 people, including 60 people in the control group and 110 people with Alzheimer's disease (AD) treated at the Podlasie Psychogeriatry Center in Białystok ("Podlaskie Centrum Psychogeriatrii w Białymstoku"). All Alzheimer's patients had mild to moderate clinical dementia based on NINDCDS-ARDRA criteria. In patients with Alzheimer's disease, the assessment of cognitive impairment was performed using the MMSE and CDT tests. The control group was appropriately matched in terms of age and sex to the AD group. Venous blood was collected from the subjects according to the procedure for the determination of elements. The subjects, sometimes with assistance of their caregivers, were surveyed on age, weight, height, smoking, medications, dietary supplements and the frequency of consumed groups of food products according to the questionnaire of the Committee of Human Nutrition Science of the Polish Academy of Sciences. The research material assessing the diet was obtained through 3-day nutritional interviews conducted with people suffering from Alzheimer's disease or their guardians, which were developed using the Diet 6.0 software recommended by the Food and Nutrition Institute in Warsaw. The consumption of

carbohydrates, proteins, fats, dietary fiber, vitamins and minerals in daily meals, including dietary supplementation, was assessed.

The concentration of mineral components was determined using the atomic absorption spectrometry (AAS) method, the flameless technique with electrothermal atomization in a graphite cuvette (Se, Cu, Cd, Pb) and atomization in an acetylene-air flame (Mg, Zn) with Zeeman background correction, using the Z-2000 Hitachi spectrophotometer (Hitachi, Japan). Total antioxidant status was determined by spectrophotometry using a kit of Randox reagents. The obtained results were statistically analyzed using the Statistica 13 software.

The diet of people with Alzheimer's disease is poor and therefore requires recommending supplementation of water deficiencies, polyunsaturated fatty acids, vitamins: D, E and folic acids, as well as calcium and magnesium. Especially DHA and vitamin D deficiency in diet may be related to cognitive decline. The AD patients have reduced levels of selenium and zinc in the blood serum. It was observed that the concentration of copper in the blood serum in the group of AD women is significantly higher than in men, and no such difference was found in the control group. Patients with Alzheimer's disease showed a higher Cu/Zn molar ratio, which is considered to be one of the markers of oxidative stress, and a significantly lower serum TAS concentration compared to the control group. It has been shown that as many as 70% of respondents with Alzheimer's disease had TAS levels below normal. The concentration of TAS in the blood serum positively correlated with the MMSE and CDT scores, which indicates a better clinical condition of these patients. However, along with the increase in Cu concentration, a significant decrease in cognitive functions was observed in the performed tests. In the case of the toxic elements, cadmium and lead, no differences between the study groups and no correlation with the tests of cognitive function assessment were found. These elements have been found not to be a direct predictor of Alzheimer's disease. Dietary habits in 15-39% may determine the concentration of Mg, Se, Cu, Zn, Cd and Pb and TAS in the serum or blood.

In conclusion, early dietary interventions aimed at eliminating existing nutritional deficiencies and increasing the antioxidant status may improve cognitive functions as well as contribute to improve the quality of life for people with Alzheimer's disease.