

Summary

Evaluation of selected indices of antioxidant status, lipid and bone metabolism in senior women with different levels of physical activity

The aim of this study was to evaluate the blood antioxidant defense mechanisms, selected lipid and bone metabolism markers, and the level of brain-derived neurotrophic factor (BDNF) in senior females with different levels of physical activity.

The study included 62 senior females aged 72.1 ± 5.4 years who were residents of the St. Elisabeth's Center in Ruda Śląska or members of the University of the Third Age in Chorzów. Each volunteer underwent physical activity level assessment and medical qualification which included physical and cardiological examination. Depending on the level of physical activity, the subjects were assigned respectively to the following three groups:

- a) first group (n=18), which took up to 5,000 steps per day,
- b) second group (n=22), which took from 5 to 10,000 steps per day, and
- c) third group (n=22), which took more than 10,000 steps per day.

An adapted accelerometer which was worn for 12-16 hours during 8 consecutive days was used to measure the subjects' daily step count. Blood samples for biochemical analyses were collected from a basilic vein of the subjects in a fasting state. All determinations were performed in the Biochemistry Laboratory at the Academy of Physical Education in Katowice. The antioxidant status was evaluated on the basis of selected determinations of the activity of antioxidant enzymes (superoxide dismutase - SOD, catalase - CAT, glutathione peroxidase - GPx, glutathione reductase - GR), concentration of non-enzymatic antioxidants (reduced glutathione - GSH, uric acid - UA) and oxidative stress markers (malondialdehyde - MDA, total oxidative stress - PerOx). Blood lipid profile was assessed by total cholesterol (TC), HDL-C fraction cholesterol, LDL-C fraction cholesterol, triglycerides (TG) and cardiovascular disease risk markers i.e. TC/HDL-C, LDL-C/HDL-C and TG/HDL-C. Concentrations of 25-hydroxycalciferol, osteocalcin, C-terminal cross linked telopeptide of type I collagen (ICTP), calcium (Ca), and parathormone (PTH) concentrations were used to assess the bone metabolism. Brain-derived neurotrophic factor (BDNF) levels were also evaluated in this study.

In this study, descriptive statistics were used: arithmetic means (AM) and standard deviations (SD) as well as medians (Med) and quartile deviations (QD) as measures of central tendency and dispersion of results around average values. Kruskal-Wallis one-way analysis of variance and Dunn's Post Hoc tests with Bonferroni correction for multiple comparisons were used to assess differences in mean levels of biochemical indices in the groups of subjects with different physical activity. Statistical inference was performed at a significance level of $\alpha = 0.05$.

It was discovered that undertaking physical activity induced beneficial but in most cases statistically insignificant changes in the antioxidant status of blood in the subjects. These changes consisted mainly of a slight increase in the concentration of reduced glutathione with simultaneous decrease in oxidative stress markers. It was also observed that physical activity differentiates the groups of the subjects in terms of indices characterizing lipid metabolism. With increased number of steps, cardiovascular disease risk indicators are significantly improved. Regarding the bone metabolism, the observed changes in the levels of markers of bone formation and bone resorption in the subjects indicate a positive role of physical activity in the prevention of osteoporosis. Low level of physical activity (<5,000 steps) may contribute to the disturbance of bone tissue metabolism. An analysis of serum neutrophilic brain-derived factor showed its significant increase in the blood serum of physically active senior females, which indicates the beneficial effect of physical activity on cognitive abilities in the subjects.

Taking into account the pleiotropic effect of physical activity on the antioxidant status, lipid and bone metabolism, and the concentration of neutrophilic brain-derived factor in the subjects which took up more than 5,000 steps per day, its special role in successful aging should be indicated.