Streszczenie w języku angielskim

Over the past few decades, the effectiveness of cancer treatment in children has significantly improved. Currently, in highly developed countries, over 80% of patients achieve complete recovery or long-term remission. As a result, long-term side effects of anticancer treatment, which significantly contribute to reduced quality of life and increased mortality, can be observed in a steadily growing population of survivors. One of the complications of childhood cancer treatment is changes in body mass and composition, particularly a tendency towards excessive accumulation of adipose tissue and a decrease in lean body mass. Accumulation of adipose tissue (which often, though not always, clinically manifests as overweight or obesity) generates a range of serious health implications, primarily cardiovascular diseases and type 2 diabetes. Recent scientific reports emphasize the significance of two additional phenomena among patients who have completed childhood cancer treatment: metabolic syndrome and sarcopenic obesity.

The main objective of the dissertation was to assess body composition, anthropometric parameters, and the presence of metabolic syndrome features in individuals treated for childhood cancer, with particular focus on body mass index, waist-to-hip ratio, percentage of body fat, muscle tissue content, lean body mass, and segmental (trunk, limbs) distribution of fat and lean tissue. The primary objectives were complemented by specific goals, which included evaluating the impact of diagnosis, gender, family history, types of treatment received, age, time since treatment completion, and occurrence of relapse on the components of body mass in childhood cancer survivors. Additionally, the frequency of metabolic syndrome and sarcopenic obesity among cancer survivors was assessed, along with the usefulness of body mass index and bioimpedance analysis as diagnostic tools for assessing body fat content.

The study included 275 former patients treated for cancer at the Department of Pediatrics, Oncology, and Hematology, Medical University of Białystok. The study group consisted of 155 males and 120 females, ranging in age from 3.2 to 32.5 years (mean 13.01 ± 5.02 years, median 13.4), treated for leukemias (n=159), lymphomas (n=37), and solid tumors (n=79). The control group comprised 134 individuals matched for age and gender (62 males, 72 females), aged 2.5-22 years (mean 12.26 ± 4.22 years, median 12); the control group included healthy siblings of the patients and children hospitalized for non-neoplastic reasons. Anthropometric measurements (body weight, height, body mass index, waist-to-hip ratio) were performed on each individual in the study and control groups, and body composition components were assessed using bioelectrical impedance analysis (BIA) with the InBody370 device. Individuals above 5 years of age in the study group also underwent laboratory tests (fasting glucose level, triglyceride level, HDL cholesterol level) and blood pressure measurements to assess the presence of metabolic syndrome features. Information regarding the treatment received (chemotherapy, radiotherapy, cumulative steroid dose, hematopoietic stem cell transplantation) was obtained from the patients' medical records. A critical level of statistical significance was set at $p<0.05$. The study obtained approval from the Bioethical Committee of the Medical University of Białystok.

In the studied population, overweight or obesity defined by BMI was observed in 25.09% of cases (69/275), compared to 17.16% in the control group (23/134). The analysis showed that the study group had significantly more patients with elevated percentage of body fat (PBF) compared to the control group (50.55% vs. 34.32%, p=0.008), as well as significantly more

patients with elevated visceral fat tissue (fat trunk mass - FTM) compared to the control group (39.13% vs. 29.01%, p=0.048), despite no differences in BMI between the groups (elevated in 25.09% vs. 17.16%; p=0.155). The study group also had significantly higher amounts of fat tissue in the upper limbs and significantly lower amounts of lean tissue in all limbs. There were no significant differences in total lean mass (p=0.282) and muscle mass (p=0.396) between the study and control groups. Further analysis showed that patients in the study group with normal BMI had significantly higher PBF (elevated in 42.46% vs. 26.33%, p=0.046), higher FTM (elevated in 25.64% vs. 14.12%, p=0.032), and significantly lower muscle mass (reduced in 42.86% vs. 27.58%, p=0.048) compared to control individuals with normal BMI. The diagnosis of leukemia was associated with significantly elevated PBF, FTM, and higher percentages of fat tissue in the limbs compared to the diagnosis of lymphomas or solid tumors. The group within 5 years of completing cancer treatment was most vulnerable to unfavorable changes in body composition. Women in the study group had significantly higher visceral fat mass than men, while men had significantly higher fat masses in the limbs compared to women. The use of radiotherapy and/or glucocorticosteroids was associated with a significant increase in PBF, FTM, and fat mass in the limbs, while the presence of relapse and hematopoietic stem cell transplantation contributed to a significant reduction in lean masses in all body compartments. Age at diagnosis and family history did not significantly affect body mass components and anthropometry. Metabolic syndrome (MS) was detected in 20 patients (7.46% of the study group). Increased waist circumference was present in 66 participants (24.63%), fasting glucose level was elevated in 33 participants (12.31%), triglyceride level was elevated in 44 participants (16.42%), HDL level was reduced in 55 participants (20.52%), and elevated systolic and/or diastolic blood pressure criteria were met by 20 participants (7.46%).

Patients with metabolic syndrome had significantly higher BMI, PBF, FTM, and fat tissue content in all limbs compared to patients who did not meet the MS criteria (p<0.00001 for all parameters). Patients meeting the criteria for sarcopenic obesity (elevated PBF and reduced muscle mass) accounted for 20.36% of the study group (56/275). This group was characterized by a significantly high percentage of individuals with normal BMI (76.79%; 43/56) and the presence of individuals with reduced BMI (12.5%; 7/56).

Based on the conducted research and statistical analysis of the results, the following conclusions were formulated: the body composition of cancer survivors differs from that of healthy peers, both in terms of fat and lean compartments, despite no differences in body mass index assessment. The occurrence of metabolic syndrome features and sarcopenic obesity are commonly observed phenomena among survivors. The body composition of children and young adults after anticancer treatment is dependent on the diagnosis, time since treatment completion, type of treatment used, and gender. The impact of time on changes in body mass components becomes more significant within the first five years after completing the treatment. Bioelectrical impedance analysis is a better indicator than BMI for assessing fat tissue content in the group of individuals treated for childhood neoplasm.

Understanding patterns of changes in body composition, fat and lean tissue content among children and young adults after anticancer treatment, as well as identifying risk factors for these changes, will enable focused attention on prevention and early intervention against overweight, obesity, metabolic syndrome, and musculoskeletal impairments in this group. The obtained results indicate the need for further long-term, multicenter studies to monitor and improve the health status of children and young adults, the population of cancer survivors.