

COMPARISON OF DIET AND PHYSICAL ACTIVITY OF CHILDREN AND ADOLESCENTS WITH PATIENTS AFTER CANCER TREATMENT

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ABSTRACT

Background. Properly balanced diet and exercise are an essential element of healthy living for children and adolescents. Particular attention should be paid to nutrition and physical activity among juniors after cancer treatment, which is one of the most important elements of the convalescence period.

Objective. The aim of the study was a comparative analysis of diet, physical activity of healthy children and adolescents with patients after cancer treatment.

Material and methods. The study involved 60 children and adolescents; 30 healthy juniors and 30 patients after treatment for cancer. An analysis of diets based on a 3-day 24-hour nutrition diary. The questionnaire surveyed collected data about participation and physical activity preferences. Statistical program-Statistica 12.0, published by StatSoft, was used to develop the results.

Results. Both groups were characterized by increased consumption of proteins and carbohydrates. Insufficient fat intake was shown in comparison with the recommended amounts in all study groups. It was observed that in the group of patients after treatment, vitamins B1, A, E and D intake was higher than in their healthy peers. Determinants of the choice of physical activity among children after cancer treatment was pleasure and fun, while among their healthy peers, aesthetic considerations (taking care of appearance).

Conclusions. Children and adolescents after cancer treatment in a much greater percentage covered of daily intake of nutrients than healthy children, and more willingly spent time on physical activity. Greater interest in physical activity in this group was probably due to previous restrictions related to illness and therapy.

Keywords: children, diet, physical activity, cancer

STRESZCZENIE

Wprowadzenie. Odpowiednio zbilansowana dieta i ćwiczenia fizyczne są niezbędnym elementem zdrowego życia dzieci i młodzieży. Szczególną uwagę należy zwrócić na odżywianie i aktywność fizyczną wśród młodych po leczeniu raka, co jest jednym z najważniejszych elementów okresu rekonwalescencji.

Cel. Celem pracy była analiza porównawcza diety, aktywności fizycznej zdrowych dzieci i młodzieży z pacjentami po leczeniu nowotworu.

Material i metody. W badaniu wzięło udział 60 dzieci i młodzieży; 30 zdrowych juniorów i 30 pacjentów po leczeniu raka. Analizę diet oparto na 3-dniowym 24-godzinny dzienniku żywieniowym. Ankieta zgromadziła zebrane dane dotyczące preferencji uczestnictwa i aktywności fizycznej. Program statystyczny Statistica 12.0, opublikowany przez StatSoft, został wykorzystany do opracowania wyników.

Wyniki. Obie grupy badanych charakteryzowały się zwiększonym spożyciem białka i węglowodanów. Niewystarczające spożycie tłuszczu wykazano w porównaniu z zalecanymi ilościami we wszystkich grupach badanych. Zaobserwowano, że w grupie pacjentów po leczeniu raka spożycie witaminy B1, A, E i D było wyższe niż u zdrowych rówieśników. Determinantami wyboru aktywności fizycznej wśród dzieci po leczeniu nowotworowym była przyjemność i zabawa, a wśród zdrowych rówieśników - względy estetyczne (dbanie o wygląd).

Wnioski. Dzieci i młodzież po leczeniu nowotworowym w znacznie większym odsetku pokrywały dzienne spożycie składników odżywczych niż zdrowe dzieci, a chętniej spędzali czas na aktywności fizycznej. Większe zainteresowanie aktywnością fizyczną w tej grupie prawdopodobnie wynikało z wcześniejszych ograniczeń związanych z chorobą i terapią.

Słowa kluczowe: dzieci, dieta, aktywność fizyczna, rak

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INTRODUCTION

The period of growth and maturation is the time in which eating habits and motivational preferences are formed. Properly balanced diet and exercise are an essential element of healthy living for children and adolescents. Improper diet and too little physical activity pose a serious health risk, increasing the risk of overweight, obesity and related diseases: type 2 diabetes, hypertension, cardiovascular disease [30].

Particular attention should be paid to the way of eating and physical activity among juniors after cancer treatment, which is one of the most important elements of the convalescence period. Cancer is a destructive disease which destroys the entire organism, and treatments such as radiotherapy, chemotherapy and surgery further damage organs and tissues, thereby causing significant damage to the heart, lungs, skeletal muscles and resulting in chronic fatigue [9].

Properly balanced diet and exercise are designed to improve cardiovascular performance, improve muscle strength and flexibility, and improve physical fitness and well-being. All of the aforementioned factors are conducive to the shortening of convalescence time, reduce the incidence of complications after oncological treatment and, above all, affect the psychosocial wellbeing of children [8, 9].

The aim of the study was a comparative analysis of diet, physical activity of healthy children and adolescents with patients after cancer treatment.

MATERIAL AND METHODS

The study was conducted among 60 children and adolescents - 30 patients after completed cancer treatment from Oncology and Hematology Clinic

in the Medical University of Bialystok Children's Clinical Hospital (group I: 13 girls and 17 boys) and 30 healthy juniors who started exercise in a fitness club (control group - group II: 16 girls and 14 boys).

Nutritional analysis was performed using a 3-day 24-hour nutrition diary. The information obtained was developed using the computer program DIETA 5 (IZZ). The questionnaire surveyed collected information about participation and physical activity preferences.

The results are summarized as average, median, range, and standard deviation. In this study we also calculated the percentage of protein, fat, and selected vitamins and minerals, according to the recommended intake (RDA), the amount corresponding to the coverage of the nutrient requirement [11].

Statistical program Statistica 12.0 was used to develop the results. Descriptive statistics have been assigned: median, quartiles, average, deviation (SD), range (minimum, maximum). The normality of the distribution was checked by the *Shapiro-Wilk* test. In the comparison of the studied groups, in the absence of normal distribution, the *Mann-Whitney U* test was used, while for the normal distribution *t-Student*. The *Chi²* test was used to compare the nominal characteristics. Statistically significant values was shown with $p < 0.05$.

RESULTS

The study involved 60 people (children and adolescents). The study group consisted of 13 girls (21.7%) and 17 boys after cancer treatment (28.3%) and 16 healthy girls (26.7%) and 14 boys (23.3%). Table 1 classifies the study group in terms of age and disease incidence.

Table 1. Division of study and control group on age and onset of disease

Respondents	Girls after illness n = 13	Healthy girls n=16	Boys after illness n=17	Healthy boys n=14
Me (Q ₁ , Q ₃)	13 (10-17)	14 (13.5-16)	16 (12-17)	14.5 (14-16)
Range	9-19	13-16	7-22	12-18

Among the surveyed groups most frequently consumed meals were: first breakfast, lunch and supper. The whole group declared eating breakfast. It was slightly less frequent to eat a second breakfast for young people after illness - 73.3%, compared to healthy children - 76.7%. Afternoon tea was more commonly consumed by children after oncological treatment - 76.7% than healthy children - 40%. Dinner was consumed by 100% of people after cancer treatment, while their healthy peers - 93.3%.

The daily nutritional rations of the studied youth were analyzed in terms of energy content, protein

content, fats and carbohydrates. The average of consumption and percentage of implementation of selected minerals and vitamins was calculated.

The mean energy value of children's diet after cancer was 2186 ± 696.1 kcal, while healthy youth provided an average of 1897.4 ± 997 kcal per day (Table 2). Differences between these values were statistically significant. There was also a statistically significant difference ($p = 0.042$) in average of the greater daily protein supply among children and adolescents (94 ± 46.5 grams) of patients after cancer treatment compared to healthy children who consumed $75\% 8 \pm 34.2$ g.

Table 2. Nutritional value of daily ration in both studied groups

Values	Children and adolescents after illness (group I)			Healthy children and adolescents (group II)			p
	Average±SD	Me	Range	Average ±SD	Me	Range	
Energy (kcal)	2186±696.1	2107.7	946-3611.8	1897.4±997	1584.2	734.2-4910	0.05
Protein (g)	94±46.5	81.6	40-258.5	75.8±34.2	66.8	36.5-195,0	0.04
Fat (g)	74±30.3	73.1	30-136.5	63.3±39.9	52.8	19.7-215,1	0.07
Carbohydrates (g)	305±101.5	298	112.8-512.2	274.6±160.2	222.8	93.3-669.0	0.06

There was also a statistically significant difference ($p = 0.042$) in the greater daily protein supply among children and adolescents after cancer, which was 94 ± 46.5 g on average, compared with healthy children who consumed $75.8 \pm 34,2$ g. The average daily intake of fats in group I was 74 ± 30.3 g while in group II 63.3 ± 39.9 g ($p=0,07$). The consumption of carbohydrates

were 305 ± 101.5 g in group I and in the second group- $274.6 + 160.2$ g.

The results for protein, fat and carbohydrate intake have been extended by comparing them with the recommended daily RDAs intake as a percentage of standard implementation (Table 3).

Table 3. Percentage of recommended daily intake of RDAs of essential nutrients in both study groups

Values	Children and adolescents after illness (group I)		Healthy children and adolescents (group II)	
	Average ±SD		Average ±SD	p
Protein (%)	172.5±81.7		130.7±58.7	0.006
Fat (%)	83.1±33.2		64±33.5	0.015
Assimilable carbohydrates(%)	218.7±74.2		195.2±119.3	0.043

The average of protein intake by group I was 172.5% and in the second group 130,7%. There was a statistically significant difference between this values ($p=0,006$). The coverage percentage of the recommended daily fat intake was insufficient in both groups. Consumption of carbohydrates assayed in the I study group was 218,7% and in II study group was 195.2% of the recommended daily intake. Differences in the dietary content of the individual components were significantly higher in group I.

Saturated fatty acid intake (SFA), mono-unsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) were analyzed. In addition, the average intake of dietary cholesterol were studied. Children in I group consumed greater amounts of monounsaturated, polyunsaturated and saturated fatty acids and dietary cholesterol, but significant differences were only related to the amount of monounsaturated fatty acids consumed in group I. Average intake of MUFA in group I were 30.3 g whereas group II only 24 g ($p =0,037$).The data were presented in Table 4.

Table 4. Consumption of fatty acids and dietary cholesterol in both studied groups

Fatty acids	Children and adolescents after illness (group I)			Healthy children and adolescents (group II)			p
	Average ±SD	Me	Range	Average±SD	Me	Range	
SFA (g)	28.9±12	28.3	9.7-55.1	26±21.3	19	7.2-118.7	0.105
MUFA (g)	30.3±14.2	27.8	10.7-60.6	24±15.1	20	5.7-69.2	0.037
PUFA (g)	9.4±4.5	8.6	3.5-19	8.4±4.5	8	2.7-17.2	0.328
Dietary cholesterol (mg)	366.5±337.8	245.2	84-1401	223.4±123.7	207.2	80-663.5	0.109

The intake of selected vitamins and minerals was assessed and RDA analysis was performed in both groups.

Group I in their daily ration provided higher amounts of vitamin E - average 9.4 mg (Me = 8.9 mg)

and vitamin D - 2.6 mg (Me = 1.5 µg), compared to group II: vitamin E - 9.2 mg (Me = 7.8 mg), vitamin D - 1.7µg (Me = 1.2 µg). Minor differences can be seen in the intake of vitamin A and C in both groups (Table 5).

Table 5. Intake of selected vitamins in both studied groups

Vitamins	Children and adolescents after illness (group I)			Healthy children and adolescents (group II)			p
	Average ±SD	Me	Range	Average ±SD	Me	Range	
Vitamin B1 (mg)	1.8± 0.9	1.6	0.4-3.8	1.4± 0.9	1.1	0.4-4	0.029
Vitamin A (µg)	1085.6± 890	811	122.6-3867.3	1012.3± 653.3	886	114.6-2587	0.102
Beta-carotene (µg)	3656± 4036.7	2077.6	135.8-20203	4310.6± 3882	3624.8	66.5-14162	0.431
Vitamin E (mg)	9.4± 4.9	8.9	1.6-24	9.2± 5.6	7.8	2-26	0.622
Vitamin C (mg)	125.4± 103.7	100.2	3.6-391.3	132±108.4	91	2.6-414.5	0.854
Vitamin D (µg)	2.6± 3	1.5	0.36-15	1.7± 1.4	1.2	0.07-6.9	0.35

The statistically significant differences were only in the higher supply of vitamin B1 (p = 0.029) in children and adolescents following oncological treatment (on

average 1.8 mg vitamin B1 (Me = 1.6 mg), compared to their healthy peers of 1.4 mg = 1.1 mg).

The daily intake of selected minerals was assessed and the results are shown in Table 6.

Table 6. Evaluation of intake of selected minerals in both studied groups

Minerals	Children and adolescents after illness (group I)			Healthy children and adolescents (group II)			p
	Average ±SD	Me	Range	Average ±SD	Me	Range	
Magnesium (mg)	330±170	290.5	135-1051	283.9±116	287.6	81.7-551	0.241
Iron (mg)	12.6±5	11	5.3-24.6	10.1±4.4	9	2.5-21	0.065
Zinc (mg)	11.7±5.7	10	5.9-32.6	9.6±4.7	8.3	4-26.2	0.051
Copper (mg)	1.3±0.5	1.2	0.6-2.52	1.1±0.5	1.1	0.3-2.2	0.905

Children and adolescents after the oncological treatment consumed higher amounts of the analyzed minerals but the statistically significant differences were only in higher zinc intake (group I – 10 mg vs. group II - 8.3 mg). Near statistical significance was the higher iron intake (group I - 11 mg vs group II - 9 mg). The above data was compared to the recommended daily RDA (Figure 1).

The coverage of the RDA for selected minerals has shown a statistically significant difference between children and adolescents of group I and healthy juniors (group II).

Differences in the percentage of recommended intake of minerals are noticeable in the group of girls after treatment who consumed larger amounts of tested ingredients than their healthy peers. Girls after treatment covered on average the recommended copper intake of 147%, zinc 116%, iron 77% and magnesium

95%. Meanwhile, their healthy peers in 106% copper, zinc 84%, iron only 56% and magnesium 67%.

Similar differences in group of boys were observed. Boys after cancer treatment covered the average the recommended intake of copper in 157%, zinc 133%, iron 123%, and magnesium 104%. Meanwhile, healthy boys covered the recommended value of minerals in 153% (copper), 108% (zinc), 103% (iron) and 81% (magnesium).

Evaluation of participation in physical education classes, there was a statistically significant relationship between the youth of both groups.

It has been observed that nearly one third of children and adolescents after treatment have attended 1-2 times a week (33.4%) to additional sports activities, slightly fewer 3-4 times a week (30%). 20% participants of group I participated in physical exercise 5 and more times per week, while 16.6%

of children and adolescents in group I declared that they did not participate in additional physical activity. Similar frequency of physical activity occurred in group II, in which 40% of participants participated in classes 1-2 times a week, 26.6% 3-4 times a week, 13.4% exercised 5 or more times a week, 20% did not participate in them at all.

The most commonly chosen physical activity in both groups was cycling, with 66.7% among healthy children, and 80% after cancer. Children and adolescents after oncological treatment are the most frequent cause of physical activity mentioned pleasure and fun (43%), while their healthy peers (43%) taking care of appearance.

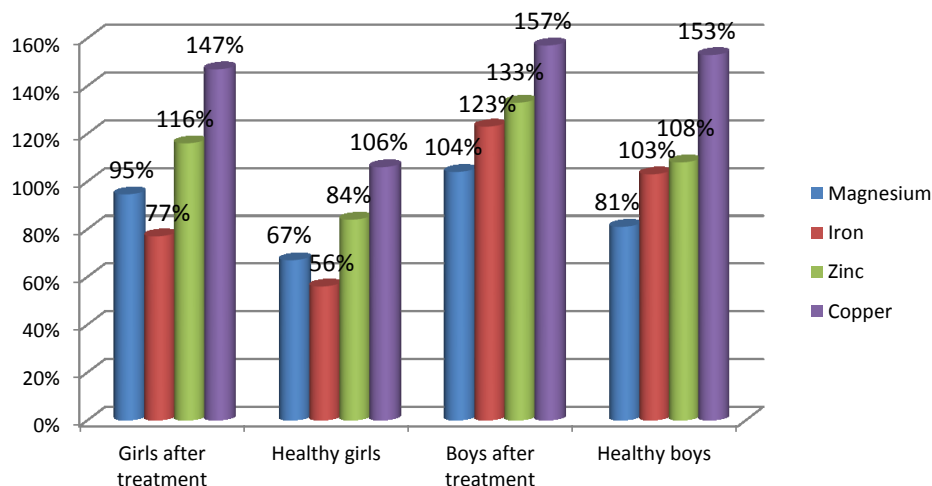


Figure 1. Percentage of recommended daily intake (RDA) of dietary minerals in study groups

DISCUSSION

Nutrition and physical activity among juniors after cancer treatment are one of the most important parts of the convalescence phase, after a long and exhausting treatment. However, there are not many publications about nutrition children with cancer, and after treatment, and to compare the results with a group of healthy children [9, 17].

A great emphasis is placed on the correct balance of the nutritional ration of patients treated in hematology and oncology clinics [22, 24]. At the time of diagnosis of cancer, it is important to remember that malnutrition is among the most significant and common complications. The diet should be individually selected, have a balanced composition, suitable for the patient and his condition [7].

In our study was no difference in the frequency of consumption first breakfast and lunch in the group of children after cancer treatment and healthy children. Little difference was observed in the rate of consumption of II breakfast (73% of children and adolescents after illness and in 76% of healthy children and adolescents). The opposite case was in the frequency of supper and afternoon tea consumption, where it was reported that the higher proportion of children in group I had consumed these meals.

Zimna-Walendzik et al. reported a healthy group of 100 children, of whom only 70% declared daily first breakfast. It was observed that similar as in own study 100% of respondents declared daily intake of dinner [30].

In studies conducted in a group of healthy Gdansk junior high school students, it was noted that the most commonly eaten meals were dinner (by 97.4%) and supper (by 93%). Moreover, the lower number of junior high school students, 83.5%, consumed the first breakfast. Gdansk's youth most often consumed afternoon tea - about 30% [28].

In our own studies it was observed that the average energy intake in the first group of children and adolescents after cancer was 2186 kcal, while among their healthy peers it was 1897 kcal. Differences were close to statistical significance. Similar results were obtained in a Jansen et al. study in group of 16 patients with acute lymphoblastic leukemia and 17 healthy children in control group. It was observed that the daily energy intake in the study group was on average 2125 kcal, while in the control group it was 1775 kcal. Both studies have confirmed the greater supply of energy in children with cancer history [10].

Analyzes of own studies showed significant differences in daily protein intake of children after oncological treatment (average 94 g/day) compared to healthy young (average 75.8 g/day). The protein supply in both groups was significantly higher than the reference values at the RDA level. Similar results in a study conducted in the group of healthy children and adolescents aged 10-12 were received by Falkowska et al. [5] in which excessive protein intake in relation to norms was observed. The average coverage of protein requirements in the group of girls was 182%

of the RDA, and 202% of the RDA in boys group. At the same time, it was noted that the study group consumed higher amounts of animal protein than plant. Similar results were obtained by *Kulińska-Szukalska et al.* [13] analyzing the daily nutrition ration of overweight children and adolescents. *Wolańska et al.* [25] in the study of healthy children aged 13-15 observed excessive protein intake, which exceeded the recommended intake of 35%. The amount of protein in the daily ration of the population of the developmental age should not exceed the recommended value. Increase in the consumption of this ingredient increases the ability to metabolize carcinogens, which may be a contributing factor to carcinogenicity [1, 18].

In our study oversupply carbohydrate intake was also observed in both groups. Children and adolescents after treatment were delivered average 305 grams carbohydrates per day, which covered 219% daily demand. Approximate results were obtained in group of healthy children (195.2% RDA and average intake was 274.6 g/day). Different results have been observed in a study of 617 healthy children and adolescents with normal body weight who were consumed less carbohydrates than recommended [5]. Also, *Kulińska-Szukalska et al.* [13] in the analyzes conducted in more than 75% of the respondents showed low intake of this ingredient among healthy school children. Similar results were also obtained in the study from 2011 [23].

In our own study, insufficient fat intake was observed in both groups. Children and adolescents after illness consumed 74 g/d of fat, which covered the RDA standard in 83.1%, while healthy children- 63.3 g/d (64% of the RDA). *Wolańska et al.* [25] observed lower fat intake in healthy children and adolescents, which in 80% covered the daily requirement for this ingredient. Similar results were obtained in works on similar topic [13, 29].

Own studies also evaluated the intake of selected vitamins and minerals in daily rations of the studied group of children and adolescents. The above-mentioned ingredients are responsible for the proper functioning of the immune system on many of its surfaces, providing adequate lymphocyte and phagocytic activity [12]. In our own study it was observed that the consumption of thiamine was significantly different in the studied groups. Children and adolescents after treatment consumed higher amounts of this vitamin (average 1.8 mg/day) compared to their healthy peers (1.4 mg/day). Similar results were obtained by *Lizoń et al.* In a group of 52 healthy children and adolescents thiamine intake was higher than the RDA. In the autumn and winter it was 1,5 mg/day and spring/summer 1.6 mg/day [15]. The consumption of vitamin B1, above the recommended standards was also demonstrated by *Błaszczyk et al.* [3] among children aged 10-13 years from Lodz.

In the own study, there were slight differences in average daily vitamin A intake. Children and adolescents in Group I consumed similar, slightly higher amounts of this vitamin (1085.6 µg/day), compared to group II (1012 µg/day). According to the Institute of Food and Nutrition RDA for vitamin A for the children in similar age as in study group is 700-900 µg/day [11]. *Błaszczyk et al.* [3] reported excessive vitamin A intake among healthy children and adolescents on average by more than 200% of the norm. In different study conducted by *Bączyk et al.* [2], a slight retinol overdose was observed in children and adolescents from the Wielkopolska Region. The average daily vitamin A intake of the group boys was 982 µg/day and 920 µg/day for girls. *Goluch-Koniuszy et al.*, in their studies, observed that boys covered the demand for this vitamin in 106%, while girls were only 79% of the standard [6].

In our study children and adolescents of healthy children group provided 9,2 mg/day of vitamin E, while after treatment - 9,4 mg/day. *Bączyk et al.* in their studies reported vitamin E deficiency among healthy children aged 10-12 years [2]. In addition, *Goluch-Koniuszy et al.* reported that in the during adolescence group, can be observed insufficient coverage of vitamin E (only 68% of RDAs), whereas in group of boys of the same age 102% of RDA [6]. Similar results were also obtained in work from 2012 [27].

Vitamin C intake among children and adolescents in Group I averaged 125.4 mg/day, while in healthy group 132 mg/day. *Bączyk et al.* observed vitamin C deficiencies in their analyzes in the group of children aged 10-12, which in only 70% covered the RDA [2]. The deficiency of this vitamin is observed especially in middle school age [19].

When analyzing own research, there was insufficient supply of vitamin D by both groups. Children and adolescents from group I provided on average 2.6 µg/day this vitamin, while their healthy peers only 1.7 µg/day. *Błaszczyk et al.* reported that the daily intake of cholecalciferol in the study group was similar (93% of RDA) [6]. Deficiency of vitamin D and calcium is very common among children in this age group [4].

In analyzing our own studies significant differences in the percentage of recommended daily intake of magnesium were observed and the incidence of cancer in the past. Young people after the illness provided 100% of the recommended magnesium intake (330 mg/day), while their healthy peers were 73.6% of the RDA (283.9 mg/day). *Szczepanska et al.* also demonstrated lower magnesium intake by girls attending gymnasium [20]. Also, *Błaszczyk et al.* emphasize that this ingredient is poor in more than half of the children surveyed [3]. Magnesium deficiency is a common phenomenon in children and adolescents,

and low levels in the body result in increased free radical production [11].

Our own research has shown that the coverage of iron requirements among healthy children was 77.6% of the RDA (average 10.1 mg/day), while their peers after cancer treatment covered the RDA in 102% (12.6 mg/day). *Błaszczuk et al.* also reported insufficient intake of this ingredient, with particular attention being paid to the group of girls, whose coverage of this microelement was 71% of the RDA [3].

In our own study, there was a significant difference in the covering the RDA range for zinc among children and adolescents after cancer treatment and their healthy peers (124.4% RDA and 11.7 mg per day), whereas in healthy children and adolescents, at 95% RDA level (9.36 mg per day). *Goluch-Koniuszy et al.*, in studies on healthy children and adolescents, noted significant deviations from the recommended daily intake of this element [6].

Copper excess was observed in daily ration, both children and adolescents after cancer, as well as their healthy peers. Healthy children covered the need for this microelement in 128% (1.1 mg per day), and the group of their peers after oncological treatment in 152% (1.3 mg per day). In *Goluch-Koniuszy et al.* [6] study, diets were characterized by copper deficiency; girls delivered 60% of the recommended standard, while boys were 71%. Both deficiency and excess copper in the diet is detrimental to the health of the young organism, excess can damage lipid DNA and proteins, and also result in metabolic changes in the organs [11].

Children who have been diagnosed with a disease are less likely to participate in physical activity and therefore, they are less likely to spend time actively. Children and adolescents commitment to physical exercise are characterized by improved well-being, slower fatigue, and less muscle atrophy due to prolonged illness [14].

In our own studies it was noted that the greater proportion of children and young people after treatment abandon their physical activity (13%) compared to their healthy peers (0%). Similar results were obtained by *Zimna-Walendzik et al.* examining healthy children and adolescents completing elementary school. It has been observed that young people are systematically attending physical education classes (80% of the respondents), and if they are absent from school, the cause is illness. The disturbing result is that only 38% of the respondents take extra physical activity after school activities [30].

People who suffer from cancer often fail despite the lack of opportunities and many inconveniences to participate in physical activities. This fact is confirmed by the study of *Malicka et al.*, in which the interest

in physical activity of young people after cancer was examined. In the group of participants of Lower Silesian OnkoOlympics, there was a great interest in the physical activity of the participants, among which the disciplines such as table tennis and swimming were particularly popular.

Pawłowska et al. in their studies compared children after cancer and healthy young people, demonstrated a significant reduction in physical activity in patients after treatment in the hematology and oncology ward [18]. Low level of motor activity was also demonstrated by *Wolin et al.* in their studies, while at the same time referring to the detrimental effect on avoiding exercise of the convalescence process of persons affected by the disease [26].

It is important that young people, both healthy and suffering from cancer, maintain their physical activity, which affects not only their appearance, but also aspects of mental and social development and is an integral part of young people's lives [21].

CONCLUSIONS

1. Both groups were characterized by increased intake of proteins and carbohydrates. However, higher intake was reported in the group after cancer treatment.
2. Insufficient fat intake was shown in comparison with the recommended amounts in all study groups.
3. It was observed that in the group of convalescents the intake of vitamins B1, A, E, D was higher than their healthy peers. In contrast, healthy children consumed higher amounts of vitamin C and β -carotene compared to the group after the illness. The difference in thiamine supply was statistically significant.
4. Children and adolescents after cancer treatment covered the demand for magnesium, iron, zinc and copper, compared to healthy children. Differences in RDA coverage were statistically significant.
5. Determinants of the choice of physical activity among children after cancer treatment was pleasure and fun, while among their healthy peers, aesthetic considerations, like taking care of appearance.

Conflict of interest

The authors declare no conflict of interest.

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