

THE CONTENT OF TRACE ELEMENTS IN THE DIET OF ADOLESCENTS IN WARSAW

ZAWARTOŚĆ PIERWIASTKÓW ŚLADOWYCH W DIETACH MŁODZIEŻY ZAMIESZKAŁEJ W WARSZAWIE

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Słowa kluczowe: *żelazo, cynk, miedź, młodzież.*

ABSTRACT

The aim of the study is to assess the contents of iron, zinc and copper in the diet among of adolescents living in Warsaw. The intake of selected trace elements was estimated on the basis of three-day dietary records. Microelement contents in the diet were calculated using Food Composition Tables. The percentage of the RDA realization for the safe level was calculated on the basis of standards for Polish population, developed by National Food and Nutrition Institute. It was demonstrated that adolescents living in Warsaw had 50-60% copper-deficient diets. The content of iron and zinc in the diet of adolescents was about 10-40% lower than recommended. Deficiency of iron in the body causes anaemia and influences learning process, therefore the content of this element in the diet of young people is especially important.

STRESZCZENIE

Celem pracy była ocena poziomu spożycia żelaza, cynku i miedzi przez młodzież zamieszkałą na terenie Warszawy. Średnie spożycie wybranych mikroelementów oszacowano na podstawie badań przeprowadzonych metodą trzydniowego bieżącego notowania oraz przy zastosowaniu tabel wartości odżywczej produktów spożywczych i odniesiono do norm dla ludności Polski opracowanych w Instytucie Żywności i Żywienia na poziomie bezpiecznym. Wykazano, że młodzież zamieszkała na terenie Warszawy miała diety niedoborowe w miedź w 50-60%. Zawartość żelaza i cynku w diecie badanych osób również była o ok. 10-40% niższa od zalecanej. Niedobór żelaza w organizmie powoduje niedokrwistość i wpływa na procesy uczenia się, dlatego zawartość tego pierwiastka w diecie osób młodych jest szczególnie istotna.

INTRODUCTION

Trace elements are essential elements of the diet, because they fulfil a lot of important functions in the organism. The significance of essential trace elements for human health is well documented [12]. Iron, zinc and copper take part in a lot of biochemical processes in the body as essential elements of metabolic active compounds. Zinc, copper and iron are the elements a number of enzymes inter alia. These elements take part in the process of synthesis of a lot of hormones in the body and in the protection from free radicals and immunological reaction [2, 13]. Iron and copper

are responsible for synthesis of red blood cells and take part in transfer of oxygen in the body too [2, 13]. Most earlier Polish studies suggest insufficient intake of copper in many regions, but data with regard to iron and zinc are inconsistent [1, 3, 8, 10]. The content of particular microelements in diet depends on nutritional habits and financial situation of the group under study and region. The present study is to complete and extend the research done in Poland. The aim of the study is to assess the content of the microelements such as iron, zinc and copper in the diet of adolescents in Warsaw. The study also determines the sources of the minerals in the diet.

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MATERIAL AND METHODS

The total sample size consisted of 78 adolescents, aged 13-18 (Tab. 1). The participants were recruited from Warsaw secondary and high schools. This research was carried out in 2006. The tool relevant to the present report was the three-day dietary records. Trace element contents in the diet were calculated using *Food Composition Tables* [6]. The standard losses of nutrients in products and dishes resulted from technological treatment were set up as 10% [13]. The percentage of the RDA at the safe level was calculated on the basis of standards for Polish population (adolescents), developed by National Food and Nutrition Institute [13]. The weighted-mean of mineral intakes of adolescents was compared to Polish standards, 66.7% and 90% of the RDA were determined as borderlines respectively [13]. The study also presented the percentage of individuals consuming mineral-deficient diets (below 90% and 66.7% of RDA at the safe level) compared to the standards. Additionally, after looking into all the menus, the main sources of dietary minerals were shown.

Table 1. Anthropometric characteristic of girls and boys (mean \pm standard error of mean)

Antropometryczne parametry dziewcząt i chłopców

Parameters	Girls n = 48	Boys n = 30
Age [y]	15.21 \pm 1.53	15.63 \pm 1.52
Body weight [kg]	52.27 \pm 8.63	68.58 \pm 10.24
Height [cm]	164.38 \pm 7.08	177.07 \pm 10.41
BMI [kg/m ²]	19.29 \pm 2.50	21.85 \pm 2.60

RESULTS

As shown in Figure 1 there was too low iron and zinc content in the diet of adolescents. The intake of copper was much lower than RDA. Generally, girls consumed less trace elements than boys (difference statistically essential) – Tab. 2.

Table 2. Nutrient intake in daily diets of girls and boys (mean \pm standard deviation)

Pobranie składników odżywczych z całodzienną dietą dziewcząt i chłopców

Component	Girls	Boys
Energy [kcal]	1603.16 \pm 469.16	2369.87 \pm 713.61
Trace elements		
Iron [mg]	8.85 \pm 3.14	12.50 \pm 4.12*
Zinc [mg]	7.00 \pm 2.16	10.50 \pm 3.51*
Copper [mg]	0.82 \pm 0.29	1.06 \pm 0.37*

* $p < 0.001$

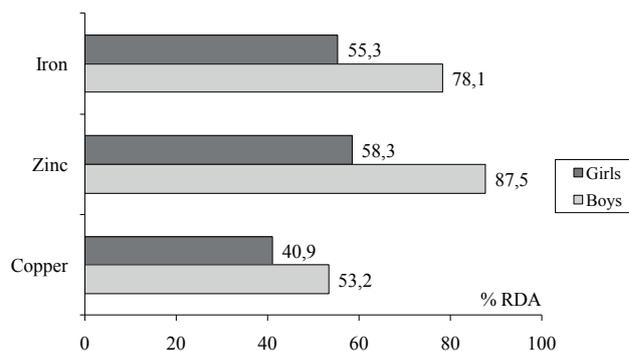


Fig. 1. The average content of trace elements in the diet among of adolescents in Warsaw compared to RDA standards

Średnia zawartość pierwiastków śladowych w diecie młodzieży w Warszawie w porównaniu z RDA

Girls and boys had 50-60% copper-deficient diets, and girls over 40% iron and zinc-deficient diet. The percentage of adolescents with trace element-deficient diets was presented in Figures 2. It is worth noting that many subjects consumed microelement-deficient diet below 90% RDA at the safe level. About 90% female and 80% male had copper-deficient diet below 66.7% RDA at the safe level (Fig. 2). These results suggested that it is a great health problem to solve by nutritionists. About 75% of girls had zinc-deficient diet below 66.7% RDA. Above 70% girls and 40% boys had iron-deficient diets (below 66.7% RDA). Iron in the diet came in from product such as cereals (30% iron amount), meat and meat products (25%), vegetables (20%). Other products supplied 25% iron together.

The sources of zinc in the diet were cereals (29%), meat and meat products (29%), milk and dairy products (15%), vegetables (13%). Other products such as eggs, fruit and fish supplied 14% this element together. Vegetables supplied 31% copper in the diet of Warsaw inhabitant, cereals – 29%, fruit – 12%, meat – 11% and other products – 17%. Low intake trace element in the diet resulted from too small consumption of bread and cereal products, vegetables in any form and meat and meat products in the diet.

DISCUSSION

In line with other Polish studies, this work shows that the intake of copper in adolescent in Warsaw is very low. Too low copper intake in the diet was confirmed by other researchers [1, 3, 8]. The percentage of the RDA of this element in the other researches was 50-85% [1, 3, 8, 10]. In line with this work, too low iron intake in the diet of girls was observed by other authors [1, 3, 8]. In this research iron-deficiency in the diet of boys was observed. Contrary to this work some authors did not notice zinc-deficiency in the diet of boys [3, 8] and

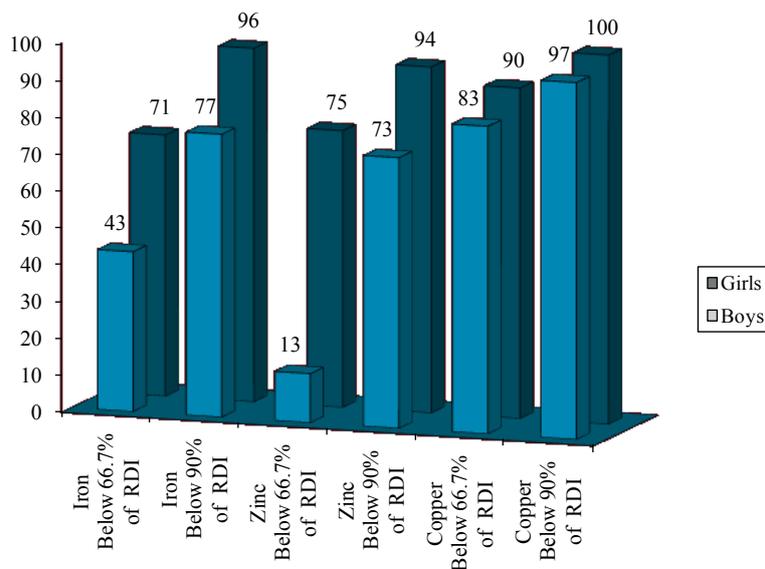


Fig. 2. The percentage of adolescents with trace elements-deficient diets
Procent młodzieży z niedoborem śladowych pierwiastków w dietach

zinc-deficiency in the diet of girls was lower [1, 3, 8]. This study results were consistent with others from different countries. Significant iron deficiencies was noted in diets of girls living in Turkey [7], Germany [4, 11], Greece [5] and Korea [9], whereas diet of American female youth included iron level sufficiently [9]. Zinc content in diets of girls living in other countries was higher than those living in Warsaw, besides girls from Turkey, who had less intake of this nutrient mineral [4, 5, 7, 9, 11]. Iron and zinc contents in diet of boys living in Germany and Korea were similar to ours, but Greeks and Americans characterized higher intake of those nutrient minerals [4, 5, 9, 11]. There was noted that diets of living in Germany and Greece included more copper quantities [4, 5].

CONCLUSIONS

1. Content of iron in the diet was lower than RDA: above 40% in the diet of girls and about 20% in the diet of boys. Inappropriate content of iron in the diet contributes to anaemia and influences learning process, therefore the content of this element in the diet of adolescents is especially important.
2. Adolescents living in Warsaw had 50-60% copper-deficient diets.
3. Girls had about 40% zinc-deficient diet and boys – 12%.
4. Many subjects had microelement-deficient diet below 90% RDA at the safe level. High percentage of people with copper-deficient diet below 66.7% of RDA at the safe level, iron-deficient diet below 66.7% of RDA and girls zinc-deficient diet below

66.7% of RDA.

5. Trace element deficiency in the diet of Warsaw inhabitants resulted from too small consumption of bread and cereal products, vegetables in any form and meat and meat products in the diet.
6. Low intake of microelements, especially iron and copper, may contribute to development of anaemia, therefore it is necessary to increase the consumption of these elements.

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