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Magnesium, Zinc and Copper Intake by Polish University Students

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Abstract: The aim of the work was to analyze the consumption of three minerals: magnesium, zinc and copper among Polish university students. The study included 708 university students aged 18-26 years. Nutritional value of students' diet was assessed using the 24-hour recall method. The minerals intake among students was compared to Polish Recommended Dietary Intake (RDI). Male students consumed more magnesium, zinc and copper than female students in comparison to the RDI (on average, male: Mg-91%, Zn-99%, Cu-67%; female: Mg-73%, Zn-80%, Cu-42%). The average male students' diets were compatible with the recommended dietary intake of magnesium and zinc. The copper intake connected with high deficiency risk was observed among over 50% of male students. The average female students' diets had too low content of all three minerals. The intake indicating high deficiency risk was revealed among 40-50% of female students for magnesium and zinc and about 90% of them for copper.

Key words: Copper, intake, magnesium, minerals, students, zinc

Introduction

Incorrect nutrition in terms of amount and quality causes unprofitable health consequences. Over consumption of energy, animal fats and sugar is usually accompanied by small consumption of fibre (Borowska and Socha, 2005; Kaluza and Brzozowska, 2005; Szymelfejnik *et al*., 2003; WHO, 2003; Wadolowska *et al*., 2000; Przyslawski *et al*., 1999; Stopnicka *et al*., 1999; Alvarez-Pineiro *et al*., 1998; Ziemlanski, 1998; Burke *et al*., 1997; Przyslawski and Gertig, 1997, Ilow and Regulska-Ilow, 1996ab). Too small intake of fibre, observed among children, teenagers as well as adults comes from Over consumption of highly refined products, which supply large amounts of energy without enough amount of vitamins and minerals, especially micronutrients (Szponar *et al*., 2003; Przyslawski *et al*., 1999; Alvarez-Pineiro *et al*., 1998; Ziemlanski, 1998; Burke *et al*., 1997; Ilow and Regulska-Ilow, 1996a,b; Montana and Lopez, 1996).

The aim of the work was to analyze the consumption of three minerals: magnesium, zinc and copper among Polish university students. These components play vital functions in human body. Magnesium and zinc, next to calcium, phosphorus and fluorine, are the constructive material of skeleton, teeth, skin and hair (WHO, 2003; Ziemlanski, 1998). Magnesium with natrium, potassium and calcium play the main role in electrolytic-water balance. In turn, copper is a component of the copper-dependent enzymes and with iron and cobalt is essential in the process of red blood cells production. The human organism can only stay healthy if it is supplied with food products in proper quantity and value proportions.

Table 1: Sample characteristics

	Females		Males	
Parameter	x	SD	x	SD
Age (year)	20.6	1.62	20.8	1.79
Height (cm)	166.5	5.74	179.3	6.98
Weight (kg)	59.0	9.01	74.3	11.37
BMI (kg/m^2)	21.3	2.73	23.1	3.06

x - mean value, SD - standard deviation

Materials and Methods

Sample: The study included university students aged 18-26, studying in years 1996-1998 at the Faculty of Food Sciences of University of Warmia and Mazury in Olsztyn, Poland, on the 1st and 4th year of study. In total diets nutritional value of 708 people, including 488 women (1st year of study: 267 subjects; 4th year of study: 221 subjects) and 220 men (1st year of study: 123 subjects; 4th year of study: 97 subjects) was assessed. Height and weight of students were measured by well-trained researches. Then the Body Mass Index (BMI) of students was calculated (Table 1). This data are a part of longitudinal study carried out since 1989 in the Department of Human Nutrition of the University of Warmia and Mazury by our team.

Food and minerals intake assessment: Nutritional value of diets was assessed using the 24-hour recall method (Charzewska *et al*., 1997). The interviews were carried out during the autumn in years 1996-1998, every day, keeping the proportions between interviews in weekdays and weekends. Every person was interviewed

Table 2: Description of consumption classes

Class number	Consumption classes
1	< 66.7% of the safe intake level
2	66.7-89.9% of the intake safe level
3	90.0-109.9% of the safe intake level
4	110.0% of safe the intake level-100.0% of the recommended intake level
4A*	> 110.0% of the safe intake level
5	> 100.0% of the recommended intake level

*for Mg only because of the value of 110% of the safe level is higher than the value of recommended level

Table 3: Ranges of minerals consumption classes'

	Mg (mg/day)		Zn (mg/day)		Cu (mg/day)	
Class No.	Females	Males	Females	Males	Females	Males
1	<187.0	<233.0	<6.7	<9.3	<1.30	<1.30
2	187.0-251.9	233.0-314.9	6.7-8.9	9.3-12.5	1.30-1.79	1.30-1.79
3	252.0-308.0	315-384.9	9.0-10.9	12.6-15.3	1.80-2.19	1.80-2.19
4	-	-	11.0-13.0	15.4-16.0	2.20-2.50	2.20-2.50
4A	>308.0	>385.0	-	-	-	-
5	-	-	>13.0	>16.0	>2.50	>2.50

for copper recommended safe level operaters, in order to indicate classes the value of 2,0 mg was accepted as the safe intake level, 2.5 mg as recommended intake level

once. The information about the consumption of food products, dishes and drinks was collected by proper questionnaires. The amount of consumed food products, dishes and drinks was estimated on the basis of "Album of photographs of food products and dishes" (Szczyglowa *et al*., 1991). The results were analysed using the software "Dietetyk v. 2.0" containing the database from the tables of content and nutritional value of food products (Nadolna *et al*., 1994).

The content of energy, protein, fat, carbohydrates and magnesium, zinc and copper, after including losses (10%), was calculated. The nutrients intake among students was compared to the Polish recommended dietary intake on the safe level (RDI) created by Ziemlanski *et al.* (1994). For the valuation the RDI was accepted for women and men in the age of 19-25, with moderate physical activity and body weight for women 60 kg, for men 75 kg.

Statistical analysis: Nutritional value of diets was also termed as nutritive density, calculating the amount of nutrients for 1000 kcal. The intake of magnesium, zinc and copper is presented in determined consumption classes (Table 2). For determining ranges of 5 consumption classes the following limits were supposed: (I) 66.7% of the safe intake level (ii) 90% of the safe intake level (iii) 110% of the safe intake level (iv) 100% of the recommended intake level (Ziemlanski *et al*., 1994). For zinc and copper 5 consumption classes were determined, for magnesium 4 consumption classes (4A class for magnesium only) because of higher value of 110% of the safe intake level than recommended intake level. The values of these nutrients ranges are collected in Table 3.

The comparison of the average values and the differentiation of collocation of women and men in consumption classes were verified on the basis of one-factor variance analysis (ANOVA) and chi^2 test. The statistical analysis was executed with the software Statistica 5.5 PL, at the significance level $p \leq 0.05$.

Results

Diets of male students had proper content of energy (2967 kcal, *i.e*. about 99% of the RDI), lower than proper content of carbohydrates (about 75% of the RDI) and higher than proper content of protein (about 178% of the RDI) as well as fat (about 118% of the RDI). The intake of energy, fat and carbohydrates by female students was lower than the recommended dietary intake and amounted about 72%, 83%, 58% of the RDI, respectively. Total women intake of protein exceeded the RDI in safe level by 14 percent points (Table 4).

Male students consumed on average more magnesium, zinc and copper than female students (Table 4). Male students consumed adequate to the RDI amounts of magnesium (on average 319 mg, i.*e*. about 91% of the RDI) and zinc (on average 13.8 mg, i.*e*. about 99% of the RDI), however lower than recommended amounts of copper (on average 1.34 mg, *i.e*. about 67% of the RDI). The analysis of the minerals after computing for 1000 kcal stated recommended amount of zinc in male students' diets (4.69 mg/1000 kcal vs. 4.67 mg/1000 kcal), however not enough magnesium (111 mg/1000 kcal vs. 117 mg/1000 kcal) and copper (0.46 mg/1000 kcal vs. 0.67 mg/1000 kcal, Table 4) in comparison to the RDI.

About 50% of men consumed magnesium and zinc in proper or higher amount (over 90% of the RDI; Table 5-6,

Table 4: The average nutrients intake by university students

	Females			Males			
Nutrient	N	x	SD	N	x	SD	p
Energy (kcal)	488	1696	689.8	220	2967	1130.0	<0.001
Energy (kJ)		404	164.2		706	269.0	
Energy (% RDI)	488	72.2	29.35	220	98.9	37.67	<0.001
Protein (g)	488	54.7	24.78	220	99.8	46.06	<0.001
Protein (g/1000 kcal)	488	32.4	8.00	220	33.5	7.97	0.096
Protein (% RDI)	488	114.0	51.63	220	178.2	82.24	<0.001
Fat (g)	488	64.8	32.70	220	118	56.6	<0.001
Fat (g/1000 kcal)	488	37.6	10.3	220	39.30	9.23	0.034
Fat (% RDI)	488	83.1	41.92	220	118.2	56.65	<0.001
Carbohydrates (g)	488	221	98.1	220	366	150.4	<0.001
Carbohydrates (g/1000 kcal)	488	132	26.01	220	124	22.7	<0.001
Carbohydrates (% RDI)	488	58.1	25.67	220	75.1	30.86	<0.001
Mg (mg)	488	204	91.2	217	319	132.4	<0.001
Mg (mg/1000 kcal)	488	127	50.0	217	111	28.3	<0.001
Mg (% RDI)	488	73.0	32.56	217	91.2	37.83	<0.001
Zn (mg)	488	7.98	3.957	220	13.8	6.10	<0.001
Zn (mg/1000 kcal)	488	4.78	1.419	220	4.69	1.120	0.404
Zn (% RDI)	488	79.9	39.57	220	98.9	43.61	<0.001
Cu (mg)	485	0.83	0.400	219	1.34	0.556	<0.001
Cu (mg/1000 kcal)	485	0.51	0.205	219	0.46	0.132	0.001
Cu (% RDI)	485	41.8	19.98	219	67.1	27.82	<0.001
Zn/Cu	485	9.95	3.089	219	10.8	4.12	0.003

N-sample size; x-mean value; SD-standard deviation; p-level of significance

Table 5: The average magnesium intake by university students' in consumption classes

	Females N = 488				Males N = 217			
Class number	N	x (mg/d)	SD (mg/d)	% RDI (%)	N	x (mg/d)	SD (mg/d)%	RDI (%)
1	239	134.7[a]	34.81	48.1	61	183.9[a]	44.20	52.5
2	129	218.9[b]	19.44	78.2	54	266.9[b]	24.24	76.2
3	63	276.4[c]	16.86	98.7	50	349.9[c]	19.10	110.0
4A	57	385.0[d]	75.80	137.5	52	503.4[d]	103.31	143.8
ANOVA	p<0.001				p<0.001			

N-sample size; x-mean value; SD-standard deviation; p-level of significance for one-factor variance analysis; a, b, c, d, e-using different letters marked significance difference at p#0.005 in columns

8). Among over 20% of men the intake of magnesium and zinc was around 50% of the RDI and it was connected with high deficiencies risk. Very low intake of copper (about 47% of the RDI) was observed among over the half of men (Table 7). The intake of copper at the level of 76% of the RDI was stated among 30% of men, while proper or higher intake was stated among merely 16% of the men sample (Table 7-8).

Among women the average intake of every analysed mineral was lower than the RDI (Table 4). The average intake of magnesium (204 mg *i.e*. 73% of the RDI) and zinc (7.98 mg, *i.e*. about 80% of the RDI) did not exceed 80% of the RDI and the intake of copper (0.83 mg) fulfilled the recommendations in 42%. The women's diets had, after computing for 1000 kcal, higher than recommended intake of magnesium (127 mg/1000 kcal *vs*. 119 mg/1000 kcal) and zinc (4.78 mg/1000 kcal *vs*. 4.26 mg/1000 kcal) and lower than recommended intake of copper (0.51 mg/1000 kcal *vs*. 0.85 mg/1000 kcal). The consequence of very low intake of copper, both among women and men and additionally among women lower than recommended intake of zinc was higher than recommended value of zinc to copper ratio (Zn/Cu; Table 4).

Proper intake of magnesium and zinc was stated among 13-14% of women (Table 5-6, 8). Almost all of female students (about 97% of the sample) had lower than recommended intake of copper (below 90% of the RDI; Table 7). The intake of copper below 66.7% of the RDI, connected with high deficiencies risk, was stated among about 90% of women (Table 7-8).

Discussion

Our results revealed an agreement with an average magnesium intake among male students and lower than recommended average magnesium intake among female students (about 80% of the RDI). Insufficient intake of magnesium, conducive to high deficiencies risk, referred to almost a half of women and one third of men. Proper amount of magnesium in men's and

Table 6: The average zinc intake by university students' in consumption classes

Class number	Females N=488				Males N=220			
	N	x (mg/d)	SD (mg/d)	% RDI (%)	N	x (mg/d)	SD (mg/d)%	RDI (%)
1	203	4.84[a]	1.425	48.4	49	7.25[a]	1.834	51.8
2	129	7.78[b]	0.653	77.8	59	11.10[b]	0.947	79.3
3	69	9.94[c]	0.560	99.4	39	13.87[c]	0.808	99.0
4	47	11.70[d]	0.543	117.0	11	15.73[cd]	0.161	112.4
5	40	16.90[d]	5.104	169.1	62	21.33[e]	5.490	152.3
ANOVA	p<0.001				p<0.001			

N-sample size; x-mean value; SD-standard deviation; p-level of significance for one-factor variance analysis; a, b, c, d, e-using different letters marked significance difference at p#0.005 in columns; * the statistic analysis was not executed

Table 7: The average copper intake by university students' in consumption classes

Class number	Females N=484				Males N=219			
	N	x (mg/d)	SD (mg/d)	% RDI (%)	N	x (mg/d)	SD (mg/d)%	RDI (%)
1	435	0.73[a]	0.255	36.7	115	0.95[a]	0.246	47.3
2	33	1.53[b]	0.127	76.4	68	1.52[b]	0.134	75.8
3	13	1.94[c]	0.133	96.8	23	2.02[c]	0.130	101.2
4	1	2.32*	0.000	116.1	6	2.36[cd]	0.094	117.8
5	2	2.74*	0.280	136.8	7	3.01[e]	0.664	150.4
ANOVA	p<0.001				p<0.001			

N-sample size; x-mean value; SD-standard deviation; p-level of significance for one-factor variance analysis; a, b, c, d, e-using different letters marked significance difference at p#0.005 in columns; * the statistic analysis was not executed

women's diets was stated among university students from Lublin (Marzec *et al.*, 2004). Proper amount of magnesium in men's diets and on the level of 66-67% of the RDI for women were stated among university students from Bialystok (Stopnicka *et al*., 1999). Low intake of magnesium (85% of the RDI) was stated among young Polish women from Bialystok (Borowska and Socha, 2005). Low intake of magnesium was also recorded among school children aged 13-15 from Poznan (girls 72-75% of the RDI, boys 82-84% of the RDI, Przyslawski *et al*., 1998). Proper intake of magnesium (91-107% of the RDI) was revealed among adults (20-59 years old) from Warsaw (Kaluza and Brzozowska, 2005) and low intake of magnesium was recorded in seniors` diets from Warsaw (Dybkowska *et al*., 2004). In turn in diets, recreated on the basis of family budget, 60% realization of the recommended intake was found (Gawecki and Hryniewiecki, 1998). Insufficient intake of this mineral in Poland was confirmed by the analysis of hair in all age groups of people, revealed a deficiency of magnesium. Its particularly low level was shown among children (Oleszkiewicz, 1996). On the other hand the analysis of the amount of magnesium in hair of university students of Medical Academy in Gdansk revealed no necessity for supplementing of the tested group with magnesium, however individual supplementation with magnesium is recommended, according to the authors of that project (Lukasiak *et al*., 1998).

These facts are worrisome because of the data indicating on the influence of magnesium deficiency in etiopathogenesis of cancer and heart coronary disease (Leone *et al*., 2006; Singh, 1997; Oleszkiewicz, 1996). Moreover it was stated that the magnesium deficiency among young women may cause delay of the first menstruation, varying periods length, painful menstruations. During pregnancy hyper contraction of the womb muscle may occur, what can be in many cases a cause of miscarriage and premature birth. Children born by mothers with the magnesium deficiency are weaker, eat worse, are less disease-resistant, sleep badly and may react with convulsions to high temperature (Oleszkiewicz, 1996).

Proper magnesium intake was stated among Spanish university students (Quiles *et al*., 1996; Alvarez-Pineiro *et al*., 1998). These authors noticed that the magnesium intake below 80% of recommended intake was stated among 40% of women and men (Quiles *et al*., 1996). Lower than recommended intake of magnesium was stated among young people aged 16-20 from Valencia (Farre-Rovira *et al*., 1999) and among university students from Luisiana, however more women than men consumed magnesium below 66% of the RDA (Zive *et al*., 1996).

Our study revealed in university male students' diets proper average zinc content, however less than a half of the men consumed zinc in proper or higher quantity. On the other hand among female students an average zinc intake oscillated around 80% of the RDI and as much as 42% of the female students consumed it below 66% of the RDI. These findings are corresponding with the results of the research of diets, recreated on the basis of family budgets (Gawecki and Hryniewiecki, 1998). It was revealed that girls' and women's diets are poor in zinc. Also, other authors stated low zinc intake among 10-year old girls (below 70% of the RDA; Champagne *et al.,*

Table 8: Sample distribution in magnesium, zinc and copper consumption classes

	Sample percentage in minerals intake classes (%)								
	Mg			Zn			Cu		
Class number	Total N=705	Females N=488	Males N=217	Total N=708	Females N=488	Males N=220	Total N=703	Females N=484	Males N=219
1	42.5	49.0	28.1	35.6	41.6	22.3	78.2	89.9	52.5
2	26.0	26.4	24.9	26.6	26.4	26.8	14.4	6.8	31.1
3	16.0	12.9	23.0	15.2	14.2	17.7	5.1	2.7	10.5
4	–	–	–	8.2	9.6	5.0	1.0	0.2	2.7
4A	15.5	11.7	24.0	–	–	–	–	–	–
5	–	–	–	14.4	8.2	28.2	1.3	0.4	3.2
chi^2 test*	chi^2 = 39.78 p<0.001			chi^2 = 63.21 p<0.001			chi^2 = 125.36 p<0.001		

*comparison of females and males distribution in minerals consumption classes

1998), young people aged 16-20 in Valencia (Farre-Rovira *et al*., 1999), among Spanish female students (80% of the RDA) and male students (70% of the RDA), university students from Luisiana (Zive *et al*., 1996) and Korean female students (Chung-Ja-Sung and Young-Hwa-Yoon, 2000). In the Spanish university students population zinc intake below the border value pertained 45% of men and 72% of women (Quiles *et al*., 1996). In diets of Polish female students and male students very low zinc intake were stated too (60% and 76% of the RDI, respectively; Bialas *et al*., 2005). Zinc amount in primary school students' diets from Poznan did not overspread the recommended dietary intake and furthermore in the 1990s was a bit lower than in the 1980s, however no statistically important differences were stated (Przyslawski *et al*., 1998).

It is believed that moderate zinc deficiencies are quite common, however it is difficult to confirm it unequivocally, because of the lack of simple nutritional status evaluation methods. The risk groups of this element deficiency occurrence are children, pregnant and lactating women, the elderly, people eating mainly vegetable food and alcoholics (Gawecki and Hryniewiecki, 1998). Low zinc deficiency may occur among children with its low intake, because of the lack of appetite and taste disorder (Ziemlanski, 1998). The deficiency of this mineral may result in roughness of the skin, hair loss, changes in the nail structure and difficulties in healing wounds. The zinc deficiency usually occur along with other nutrients deficiency especially protein and energy, what also makes their diagnosis difficult (Gawecki and Hryniewiecki, 1998). Zinc deficiency may cause insulin level reduction and glucose tolerance malfunction, may carry weight on the inefficiency of immune system and cancer. It was stated that mental illnesses occurrence binds with the zinc deficiency. In turn the zinc deficiency among pregnant women may be a risk element of pregnancy disorders, a cause of a bad foetus growth, high ratio of prebirths, relatively frequent growth defects (Oleszkiewicz, 1996). The differentiation in zinc intake was stated to be connected to the amount of consumed energy and with the race of pregnant women (Neggers *et al*., 1998). The analysis of the amount of zinc in Medical Academy students hair in Gdansk did not reveal any individual, substantial deficiencies of this mineral (Lukasiak *et al*., 1998).

The Olsztyn university students' diets had very low copper content (women: 42% of the RDI on average, men: 67% of the RDI on average). It was revealed that as many as over 50% of male students and about 90% of female students was consuming copper below 66% of the RDI, what means in the insufficient amount, connected with high deficiencies risk. In diets of university students from Lublin and Poznan very low intake of copper was stated (Lublin: male 70% of the RDI, female 50% of the RDI; Poznan: male 56% of the RDI, female 60% of the RDI; Bialas *et al*., 2005; Marzec *et al*., 2004). Diets of many population groups from the region of Wielkopolska in Poland had improper copper content and men consumed much more copper than women (Szajkowski, 1996; Przyslawski *et al*., 1998). In Poland the amount of copper in diets, recreated on the basis of family budgets, was very low in comparison to the recommended dietary intake (Gawecki and Hryniewiecki, 1998). The average copper intake below 70% of the RDA was revealed among children aged 10 (Champagne *et al*., 1998).

According to Ziemlanski (1998) the copper deficiency is rare among people. However, hipocupremium states may occur, what was stated in several disease units, for instance kwashiorkor and to a very large extent malnutrition. The copper deficiency may also occur among people consuming mainly dairy products and in lingering illnesses of alimentary canal. The symptoms of the copper deficiency are the anaemia, which is caused by hampered iron transport to the haemoglobin synthesizing tissues and the curtailment of the red blood cells life expectancy, as well as snapping of blood vessels, increased bone fragility, heart dysfunction,

increase of the cholesterol level, reduction of the humoral and cellular immunity and the lack of pigment in the skin (Gawecki and Hryniewiecki, 1998).

Our results revealed in students' diets too high Zn/Cu ratio, which was caused mainly by very low copper intake. The data show that the stated Zn/Cu ratio is unprofitable because its increase is conductive to and at the same time its decrease prevent, the development of ischemic heart disease (Szajkowski, 1996; Lukasiak *et al*., 1998). Szajkowski (1996) proved that diets having high amount of animal fat and sugar and low amount of fibre have high zinc to copper ratio. It was also revealed that the diets, which had too much protein and saturated fatty acids and insufficient amount of carbohydrates and fibre had too low amount of magnesium and zinc (Farre-Rovira *et al*., 1999). In turn high fibre intake (>20 g/day) was connected with higher proper magnesium and zinc intake probability (Nicklas *et al*., 2000) and the main source of the analysed nutrients were cereals, vegetables and fruit as well as milk and meat (Zive *et al*., 1996).

In many studies it was stated that diets of different populations, including university students, had too high saturated fats and animal protein intake and too low complex carbohydrates content (Switoniak *et al*., 1995; Koszewski and Kuo, 1996; Montana and Lopez, 1996; Quiles *et al*., 1996; Alvarez-Pineiro *et al*., 1998; Hendricks and Herbold, 1998; Wadolowska *et al*., 1998). This state was a result of high fats as well as meat and its products intake and of insufficient intake of cereals, fruit and vegetables (Ilow and Regulska-Ilow, 1996a,b). Whereas it is taken into consideration that cancer occurs twice less frequently among people consuming vegetables and fruit in large amount, in comparison to those who eat only a few of them and among whom micronutrients deficiency occurres, including zinc deficiency (Kruk, 2006; Ames, 1998; Ziemlanski, 1998). The analysis of changes in minerals consumption in diets of school children from Poznan in the 1990s in comparison to the 1980s showed changes in the food intake structure, however they did not have any vital effect on the observed too low level of their consumption. According to the authors even similar intake cannot lead to rush conclusions, because it is essential to consider different assimilation of minerals of various food, as well as their interaction. In the 1990s, in comparison to the 1980s the role of animal products (meat, pork-butcher's meat, milk, eggs) as the source of magnesium has decreased, however the role of cereals, vegetables and fruit has increased. A regularity in zinc and copper intake structure was observed. In diets of the 1990s the share of animal products as well as carotene rich vegetables and fruit (boys' diets), eggs and beans (girl's diets) as the source of zinc and copper has decreased, while the share of cereals, vegetables and fruit has increased (Przyslawski *et al*., 1998).

Observed insufficient cooper intake among university students from Olsztyn, as well as the occurrence of high low-Mg-and-Zn-intake population percentage seems to confirm other authors' data about unprofitable dietary habits, finding expression in improper food selection-low cereals intake, especially wholemeal (Sekula, 1997), dairy products, vegetables and fruit as well as beans intake (Przyslawski *et al*., 1999; Stopnicka *et al*., 1999). Attention should be drawn to education of young people from the point of view of proper intake structure, the frequency of valuable food consumption, leading to the change of improper dietary habits. Not varied, monotonous diet is the factor of the development of illnesses caused by improper dieting such as: blood circulation system diseases, cancer, insulin-not-dependent diabetes, obesity, the iron-deficiency anaemia and osteoporosis.

Conclusions: Male students consumed more magnesium, zinc and copper than female students. The average male students' diet were compatible with the recommended dietary intake of magnesium and zinc. The copper intake connected with high deficiency risk was observed among over 50% of the male students. The average female students' diets had too low content of all three minerals. The intake indicating high deficiency risk was revealed among 40-50% of female students for magnesium and zinc and about 90% of them for copper.

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