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ASSESSMENT OF FRUIT AND VEGETABLE INTAKE AMONG THE
POPULATION OF JUNIOR HIGH SCHOOL STUDENTS FROM OLEŚNICA

OCENA SPOŻYCIA OWOCÓW I WARZYW W POPULACJI GIMNAZJALISTÓW
Z OLEŚNICY

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The study assessed the fruit and vegetable intake of junior high school youth. The mean daily total consumption of fruit and vegetables by the junior high school students was 358.5 g/day. Compared with current dietary recommendations, intakes of fruit and vegetables were too low.

Key words: fruit, vegetables, consumption, junior high school students, food frequency questionnaire

Słowa kluczowe: owoce, warzywa, spożycie, gimnazjaliści, kwestionariusz częstotliwości spożycia

INTRODUCTION

Fruit and vegetable provide the organism with nonstarch polysaccharides, dietary fiber, water, mineral elements and bioflavonoids. They usually have low energetic value, they do not cause high after-meal glycemia and are an irreplaceable source of vitamin C, carotenoids and folic acid. Because of the aforementioned values, they play a beneficial role in the course and prevention of circulatory system diseases, cancerous diseases, obesity, and metabolic syndrome, which has been confirmed in numerous epidemiological studies [5, 10, 15].

The aim of this study was to assess the fruit and vegetable intake of junior high school youth.

MATERIAL AND METHODS

Research was conducted among the students of Junior High School No. 2 in Oleśnica between March and April 2005. Participation in the research was voluntary. Out of 476 distributed questionnaires, 113 correctly completed forms were collected (response rate: 23.7%).

Among 113 participants of the research there were 65 girls and 48 boys. The age of the examined students was within the range of 12 and 16 years. The average age of the girls was 14.1 ± 1.0 years, and the boys 14.6 ± 0.8 years. Average growth, body mass and the body mass index (BMI) in the group of girls were respectively: 163.5 cm; 52.2 kg; 19.5 kg/m^2 , and in the group of boys: 172.3 cm; 59.5 kg; 20.0 kg/m^2 .

In order to assess the intake of fruit and vegetable, the method of food frequency questionnaire was used. The same questionnaire was used as the one applied in 2004 in the research assessing fruit and vegetable intake in the population of high school students in Olešnica [6]. It contained questions referring to consumption of 20 vegetable products (vegetables, fresh vegetable salads, salads, vegetable soups, vegetable-fruit and vegetable juices) and 14 fruit products (fruit, fruit juices) in the past month. Junior high school students were describing the size of portions of fruit and vegetables consumed during completion of the questionnaire by accepting an average portion suggested in the questionnaire (e.g. 1 medium apple). They could also choose a small or large portion. The students were defining the frequency of fruit and vegetable consumption by choosing from the following options: every day, once a week, once a month, rarely/ never.

When calculating total vegetable intake, vegetable soups, vegetable-fruit and vegetable juices and also potatoes were not taken into account. In many statistical surveys, potatoes are not regarded as vegetables and they are a separate group. In the total amount of consumed fruit, fruit juices and lemons were not taken into account. Calculations were done with the use of a Microsoft Excel 2002 spreadsheet.

RESULTS AND DISCUSSION

The quantitative assessment of fruit and vegetable intake by junior high school students is presented in tables I and II and the structure of consumption in tables III and IV.

After analysis of the obtained results, it was found that variables presenting average consumption of particular fruits and vegetables in the examined group of junior high school students did not have normal distributions, which was proven by high values of standard deviations and significant differences in average values and medians describing the consumption. Median was taken into account for assessment of consumption of the examined products, because it is a variable allowing for a very differentiated frequency of appearance of particular fruits and vegetables in all-day food rations.

Average daily fruit and vegetable consumption, by girls and boys, shown as a sum of medians, amounted to 358.5 g/person. According to nutritional recommendations for the European population, daily consumption of fruit and vegetable should not be lower than 400 g/person [13]. The American Heart Association [8], bearing in mind the prevention of ischaemic heart disease, recommends consumption at least five servings of fruit and vegetables a day. The examined group of youth did not fulfill any of the mentioned recommendations. Considering the fact that nutritional habits are developing at a very young age, it is essential to correct nutritional behavior of the examined population aiming for an increase in consumption of fruit and vegetables. Data of the World Health Organization [12] show that in these regions of Europe where a premature death rate from various causes was the lowest, consumption of fruit and vegetable in the age group of 15-29 years, indicated by a median, was 423 g/person/day.

Table I. The quantity of fruit consumed by the examined group of girls (G, n = 65) and boys (B, n= 48) in g/day

Fruit	Average \pm SD G	Median G	Average \pm SD B	Median B	Average \pm SD G + B	Median G + B
Apple	116.1 \pm 75.2	109.5	107.1 \pm 84.3	109.5	112.3 \pm 79.0	109.5
Banana	40.1 \pm 52.3	30.0	41.6 \pm 67.0	15.0	40.8 \pm 58.7	21.4
Pear	15.0 \pm 28.0	3.4	11.0 \pm 20.9	0.0	13.3 \pm 25.2	1.7
Plums	3.5 \pm 6.9	0.0	6.7 \pm 17.5	0.0	4.8 \pm 12.6	0.0
Orange	60.7 \pm 63.3	48.0	54.2 \pm 58.7	25.7	57.9 \pm 61.2	48.0
Mandarin	52.8 \pm 74.2	32.3	33.3 \pm 39.3	15.4	44.5 \pm 62.3	21.8
Grapefruit	18.1 \pm 38.0	3.4	8.4 \pm 17.7	1.7	14.0 \pm 31.3	3.4
Kiwi	11.0 \pm 23.3	2.6	12.9 \pm 28.8	2.6	11.8 \pm 25.7	2.6
Peach	6.4 \pm 10.7	2.6	3.9 \pm 5.8	0.0	5.3 \pm 9.0	2.6
Lemon	7.5 \pm 9.2	3.2	7.7 \pm 8.8	4.0	7.6 \pm 9.0	3.7
Strawberries	2.8 \pm 5.0	0.0	2.8 \pm 6.5	0.0	2.8 \pm 5.7	0.0
Grapes	11.0 \pm 16.0	4.4	8.7 \pm 13.5	2.2	10.0 \pm 15.0	4.4
Frozen fruit	4.3 \pm 9.9	0.0	2.5 \pm 6.1	0.0	3.5 \pm 8.6	0.0
Fruit juices	268.5 \pm 206.3	230.0	239.8 \pm 228.1	230.0	256.3 \pm 215.3	230.0

In the regions of Europe with the highest premature death rate from various causes this daily value was respectively 196 g for women and 233 g for men.

Consumption of fruit, in groups of girls and boys, shown as a sum of medians, amounted to 215.4 g/day, and vegetables 143.1 g/day (tables I and II). Results obtained in the research were similar to the values obtained by the Central Statistical Office - Warsaw (CSO). According to the data of CSO [2,3], based on "Household Budgets", consumption of fruit in Poland in 2002 and 2003 amounted to 127.7 g/person/day and 135.7 g/person/day respectively. Consumption of vegetables in the same years amounted to 179.3 g/person/day and 183.7 g/person/day. Very similar quantities of vegetables in the all-day food ration were observed in a group of women and men in Ireland [11] with 132 and 149 g/person, respectively. Fruit appeared in food rations of the Irish in smaller amounts than in domestic research, for women it amounted to 140 g and for men 133 g.

Average fruit consumption in Poland in the years 1993-2002 as assessed by the Food and Agriculture Organization – FAO [4] amounted to 123.3 g/day and was over two times less than the average in European Union countries. Consumption of vegetables in Poland in years 1993-2002 according to FAO was however higher than the average in the European Union countries and amounted to about 334.3 g/day. Discrepancies in the assessment of consumption by CSO and FAO probably result from using different calculation methods. The method of household budget analysis used by CSO is more reliable than the method based on food balances used by FAO, taking into account global food production as well as exports and imports.

In the study [14] assessing the diets of elementary school children from the former Białystok Voivodship, it was stated that 46.2% of youth did not consume any vegetables

Table II. The quantity of vegetables consumed by the examined group of girls (G, n = 65) and boys (B, n = 48) in g/day

Vegetable	Average \pm SD G	Median G	Average \pm SD B	Median B	Average \pm SD G + B	Median G + B
Carrot	22.0 \pm 20.2	17.2	19.8 \pm 26.9	8.3	21.1 \pm 23.2	17.2
Cauliflower	5.5 \pm 8.0	4.4	7.8 \pm 23.4	0.0	6.5 \pm 16.3	0.0
Onion	14.0 \pm 19.2	9.2	13.8 \pm 21.5	9.2	13.9 \pm 20.1	9.2
Garlic	0.4 \pm 0.7	0.0	0.4 \pm 0.9	0.0	0.4 \pm 0.8	0.0
Pepper	10.5 \pm 18.2	2.4	9.9 \pm 10.5	8.0	10.2 \pm 15.3	5.6
Tomato	40.9 \pm 43.4	18.2	48.4 \pm 65.7	37.7	44.1 \pm 53.9	32.5
Cabbage	5.4 \pm 8.2	1.8	7.1 \pm 11.2	4.2	6.1 \pm 9.6	1.8
Sauerkraut	9.7 \pm 10.4	9.1	11.4 \pm 13.7	9.1	10.4 \pm 11.9	9.1
Cooked cabbage	5.0 \pm 6.9	0.0	6.0 \pm 11.9	0.0	5.4 \pm 9.3	0.0
Beets	11.3 \pm 14.5	7.0	12.0 \pm 17.6	7.0	11.6 \pm 15.8	7.0
Cucumber	24.2 \pm 22.6	15.5	26.8 \pm 30.4	20.9	25.3 \pm 26.1	20.2
Corn	11.9 \pm 18.3	2.9	9.4 \pm 15.1	6.7	10.8 \pm 17.0	2.9
String beans	5.9 \pm 10.1	2.9	5.0 \pm 9.5	0.0	5.5 \pm 9.8	2.9
Lettuce	5.4 \pm 8.7	1.2	4.3 \pm 6.9	1.2	4.9 \pm 8.0	1.2
Radish	6.9 \pm 10.3	3.5	4.2 \pm 6.2	1.5	5.7 \pm 8.9	2.9
Vegetable salad	19.2 \pm 38.0	5.3	22.1 \pm 34.4	10.1	20.4 \pm 36.4	7.5
Fresh vegetable salad	34.3 \pm 35.3	11.2	39.8 \pm 35.8	23.2	36.6 \pm 35.4	23.2
Vegetable soups	144.6 \pm 141.2	116.0	129.4 \pm 133.4	116.0	138.1 \pm 137.5	116.0
Vegetable juices	45.2 \pm 83.0	6.9	29.8 \pm 61.4	0.0	38.7 \pm 74.7	0.0
Fruit and vegetable juices	128.4 \pm 138.1	66.7	68.4 \pm 95.2	32.2	102.9 \pm 124.9	66.7

per day. Absence of vegetables in the all-day food ration was declared by 41.5% of girls and 50.7% of boys. In the study conducted in 2005 in the population of high school students in Oleśnica [6], consumption of vegetables by girls amounted to 148.9 g/day and boys 126.9 g/day. In the above-mentioned study, fruit was consumed by girls in the amount of 180.3 g/day and by boys – 161.6 g/day. It was found that high school students from Oleśnica consumed 331.6 g of fruit and vegetables every day. Consumption of fruit and vegetables among the girls amounted to 329.2 g, and the boys 288.5 g/day.

A significant share of fruit and vegetables in food rations contributes to reduction of energy supply. In the studies [9] a relation between low fruit and vegetable consumption and body mass increase among boys and girls was proven.

Table III presents the structure of fruit consumption in the examined group of junior high school students. Both the girls and the boys were consuming apples most willingly. Next in descending order there were oranges, mandarins and bananas. It results from the general availability of these fruits in the winter – spring season.

Table III. The structure of consumption of fruit in the examined group

FRUIT	Girls		Boys	
	Median [g/day]	%	Median [g/day]	%
Apple	109.5	46.4	109.5	63.6
Orange	48.0	20.3	25.7	14.9
Mandarin	32.3	13.7	15.4	8.9
Banana	30.0	12.7	15.0	8.7
Grapes	4.4	1.9	2.2	1.3
Pear	3.4	1.4	0.0	0.0
Grapefruit	3.4	1.4	1.7	1.0
Kiwi	2.6	1.1	2.6	1.5
Peach	2.6	1.1	0.0	0.0
Overall	236.2	100	172.1	100

From the review study by *Kazimierczak* [7] it is shown that in the years 1993-2002 about half of the fruit consumed in Poland were apples (53.3-70.0 g/person), and 11% berries. A tendency of growth in tropical fruit consumption was observed, recently estimated at 21%.

In the high school in Oleśnica, girls and boys also most frequently consumed apples, bananas and oranges [6]. Other fruit, because of their seasonable nature were not consumed regularly. In other studies it was proven that the most enjoyed seasonal fruits are peaches, sweet cherries, strawberries and grapes [1].

Table IV. The structure of consumption of vegetables in the examined group

VEGETABLE	Girls		Boys	
	Median [g/day]	%	Median [g/day]	%
Tomato	18.2	16.3	37.7	25.6
Carrot	17.2	15.4	8.3	5.6
Cucumber	15.5	13.9	20.9	14.2
Fresh vegetable salad	11.2	10.0	23.2	15.8
Onion	9.2	8.2	9.2	6.3
Sauerkraut	9.1	8.1	9.1	6.2
Beets	7.0	6.3	7.0	4.8
Vegetable salad	5.3	4.7	10.1	6.9
Cauliflower	4.4	3.9	0.0	0.0
Radish	3.5	3.1	1.5	1.0
Corn	2.9	2.6	6.7	4.6
String beans	2.9	2.6	0.0	0.0
Pepper	2.4	2.1	8.0	5.4
Cabbage	1.8	1.6	4.2	2.9
Lettuce	1.2	1.1	1.2	0.8
Overall	111.8	100	147.1	100

Table IV shows the share of individual vegetables in total vegetable consumption. Both the girls and the boys most liked tomatoes. In the high school in Oleśnica the girls consumed

tomatoes most willingly, and the boys preferred fresh vegetable salads [6]. In Poland, the largest share in vegetable consumption in years 1993-2002 had cabbage, carrots, tomatoes, cucumbers and onions. An increase in tomato consumption has been observed recently, which is related to the availability of these vegetables throughout the year [7].

Systematic and continuous education of youth as far as rules of rational nutrition are concerned could have a positive influence on the increase in consumption of fruit and vegetables. Insufficient consumption of fruit and vegetables, resulting from incorrect nutritional habits can lead to the development of metabolic diseases with nutritional background in later life.

CONCLUSIONS

1. Consumption of fruit and vegetable in the examined group of youth was insufficient in comparison to the recommended quantities.
2. A higher consumption of fruit rather than vegetables was found among the examined junior high school youth.

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OCENA SPOŻYCIA OWOCÓW I WARZYW W POPULACJI GIMNAZJALISTÓW Z OLEŚNICY

Streszczenie

Celem pracy była ocena spożycia owoców i warzyw w populacji młodzieży gimnazjalnej. W badaniu uczestniczyło 113 uczniów Gimnazjum Nr 2 w Oleśnicy. Do oceny spożycia owoców i warzyw zastosowano metodę wywiadu częstotliwościowo-ilościowego. Stwierdzono, że najczęściej występującymi warzywami w diecie dziewcząt były: pomidory, marchew, ogórki i surówki warzywne, zaś w posiłkach chłopców: pomidory, surówki warzywne, ogórki i sałatki jarzynowe. Dziewczeta i chłopcy deklarowali, że najczęściej spożywanymi owocami były: jabłka, pomarańcze, mandarynki i banany. Ogółem młodzież gimnazjalna spożywała średnio 358.5 g/dzień warzyw i owoców. W porównaniu do zaleceń była to ilość niewystarczająca.

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Summary

The aim of this study was to assess fruit and vegetable intake among the population of junior high school students. 113 students from Junior High School No. 2 in Oleśnica participated in the research. In order to assess the intake of fruit and vegetables, the method of food frequency questionnaire was used. It was stated that vegetables appearing most frequently in the diet of girls were: tomatoes, carrots, cucumbers and fresh vegetable salads, and in the meals of boys were: tomatoes, fresh vegetable salads, cucumbers and vegetable salads. Boys and girls declared that the most often consumed fruits were: apples, oranges, mandarins and bananas. The mean daily total consumption of fruit and vegetables by the junior high school students was 358.5 g/day. Compared with current dietary recommendations, intakes of fruit and vegetables were too low.

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