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ANALYSIS OF THE NUTRITIONAL VALUE OF DIETS OF YOUTH FOLLOWING VARIOUS FOOD PATTERNS. PART II – FOOD PATTERNS OF GIRLS

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This study analyses the nutritional value of diets of girls who follow three different food patterns, expressed as different frequencies of consuming alcohols, legumes, fish, beef, margarine and butter. One hundred and seventy-eight girls, aged 15-18 years from secondary schools of various types situated in the Suwałki region and in the city of Olsztyn were included in the study. Factor analysis was applied to the information about the frequency of consuming 21 products, which resulted in identifying 8 food patterns typical of young people. Three selected food patterns were further analysed. These were: alcohol (food pattern II), legumes, fish and beef (food pattern V) and margarine (food pattern VII). None of the food patterns analysed in this study had the correct nutritional value or pro-health characteristics. An increase in the frequency of consuming legumes, fish and beef, an increase in the frequency of consuming alcohol or an increase in the frequency of consuming margarine with a concurrent decrease in the frequency of consuming butter, resulted in reduction of the amounts of many vitamins, minerals and fibre in the girls' diets. A growing frequency of alcohol consumption was accompanied by other undesired eating habits, such as an increasing consumption of high fat snacks or a decrease in the consumption of low fat meat products and wholemeal bread. As the frequency of consuming margarine increased, the energy value of the diet decreased, and the drop in the frequency of legumes, fish and beef consumption was associated with the reduction of fat and, paradoxically, PUFA in the diet. The results indicate that an increase in the frequency of consuming alcohols, legumes, fish, beef and margarine resulted in decreasing the nutritional value of the girls' diets and was caused by their being less varied.

INTRODUCTION

According to the results of both nation-wide [Kunachowicz *et al.,* 2005; Gronowska-Senger, 2005] and world-wide studies [WHO, 2003], there is a close relationship between consumed food and the nutrients contained in it on the one hand, and human health on the other. They also showed that the correct development process, physical and mental fitness and the general health condition of a human are closely linked to the eating habits and the health-related properties of food, and mainly with its nutritional value. This knowledge is constantly being broadened; this refers especially to the area of preventing diseases related to incorrect intake. These include: cardiovascular diseases, obesity, type 2 diabetes, some forms of cancer and osteoporosis. Their causes include numerous environmental factors, related to consuming excessive and/or insufficient amounts of nutrients [WHO, 2003; Lopez-Garcia *et al.,* 2004; Ostrowska, 2004]. According to literature, consuming excessive amounts of food with high energy density, rich in animal fat and absorbable carbohydrates favours diet-related diseases [Kant & Graubard, 2005; Drewnowski *et al.,* 2004; Drewnowski & Specter, 2004; Rolls *et al.,* 2005]. These diseases are also associated with consuming alcohol and stimulants, because that behaviour is frequently associated with consuming excessive amounts of high-fat food, snacks, sweets and sweet drinks [Wądołowska *et al.,* 2001]. There is also evidence that food can reduce the risk of diet-related diseases. Consuming low fat food, containing a lot of fibre, plant protein, vitamins and mineral, effectively prevents *e.g.* obesity, some forms of cancer, ischaemic heart disease, atherosclerosis and osteoporosis [Dixon *et al.,* 2004; Hoffman *et al.,* 2004; Moorman & Terry, 2004].

Studying eating habits of children and adolescents is highly justified. Incorrect eating behaviour during this period may lead to development and maturation disorders and also is conductive to maintain the wrong habits in adult life, aggravating the delayed health outcome [Dai *et al.,* 2002; Fleming, 2002].

This study is a continuation of research into the relationship between adolescents' eating behaviour and the nutritional value of their diets [Waluś *et al.,* 2006a, b]. The previous paper analysed the nutritional value of diets eaten by boys following different food patterns. This study deals with selected food patterns followed by girls and their effect on the nutritional value of their diets, and attempts to determine the extent to which the positive/negative food patterns affect the high/low nutritional value of the girls' diets.

MATERIALS AND METHODS

The study was conducted in autumn 2002 and 2003 and covered altogether 567 people aged 15 to 18 (average 16.1±0.44). The study sample consisted of various profile secondary school students. It was assumed that number of

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TABLE 1. The frequency of consuming 21 products by girls in quintiles of frequency of alcohol consumption.

Products	Frequency of consumption (times/day)						
	Total	Quintiles of frequency of alcohol consumption					
		Q1 (lowest)	Q2	Q3	Q4	Q5 (highest)	p of the trend
	$\bar{x}$±SD	$\bar{x}$±SD	$\bar{x}$±SD	$\bar{x}$±SD	$\bar{x}$±SD	$\bar{x}$±SD	
Beef	0.08±0.108	0.08±0.075	0.10±0.121	0.09±0.143	0.08±0.106	0.07±0.081	NS
Beer*	0.03±0.076	0.00±0.007	0.01±0.008	0.01±0.009	0.01±0.006	0.18±0.167	NS
Butter	1.63±1.072	1.87±1.163	1.78±0.871	1.42±1.098	1.39±1.026	1.76±1.137	NS
Chips and other hot snacks	0.14±0.199	0.10±0.085	0.12±0.132	0.16±0.268	0.18±0.209	0.21±0.331	<0.001
Crisps and other salted snacks	0.35±0.561	0.41±0.624	0.27±0.522	0.43±0.672	0.28±0.300	0.27±0.211	NS
Fish	0.14±0.155	0.13±0.144	0.11±0.130	0.15±0.162	0.13±0.142	0.17±0.185	NS
Fruit	1.21±0.897	1.20±0.912	0.86±0.515	1.19±1.020	1.45±0.926	1.45±1.042	NS
Fruit juices	0.70±0.781	0.69±0.834	0.52±0.369	0.72±0.905	0.81±0.872	0.77±0.745	NS
Legumes	0.11±0.148	0.08±0.066	0.06±0.037	0.17±0.270	0.13±0.137	0.14±0.119	NS
Margarine	0.43±0.734	0.56±0.822	0.51±0.800	0.30±0.614	0.35±0.668	0.19±0.367	0.020
Milk	0.92±0.851	1.08±0.980	0.84±0.706	0.89±0.901	0.97±0.853	0.63±0.700	NS
Pork	0.41±0.497	0.39±0.459	0.54±0.569	0.27±0.318	0.39±0.443	0.53±0.733	NS
Poultry	0.46±0.443	0.69±0.579	0.53±0.368	0.34±0.369	0.30±0.252	0.23±0.159	0.008
Raw vegetables	0.75±0.657	0.88±0.753	0.79±0.736	0.56±0.536	0.81±0.618	0.60±0.467	NS
Sweet drinks	0.61±0.670	0.90±0.892	0.61±0.516	0.45±0.406	0.43±0.636	0.52±0.556	NS
Sweets	0.82±0.753	1.29±0.960	0.67±0.531	0.64±0.618	0.66±0.509	0.42±0.342	0.070
Vegetable juices	0.45±0.640	0.45±0.671	0.34±0.298	0.52±0.744	0.47±0.735	0.53±0.753	NS
Vodka*	0.01±0.023	0.00±0.002	0.00±0.003	0.00±0.005	0.01±0.008	0.03±0.065	0.069
Wholemeal bread	0.63±0.800	1.04±1.070	0.56±0.638	0.39±0.599	0.53±0.674	0.30±0.343	0.079
Wine*	0.01±0.017	0.00±0.004	0.00±0.004	0.00±0.007	0.01±0.008	0.02±0.048	0.047
Yogurt	0.49±0.498	0.60±0.560	0.51±0.575	0.42±0.452	0.42±0.330	0.48±0.501	NS

* the products which make up food pattern II, $\bar{x}$ – mean value, SD – standard deviation, p – level of significance, NS – insignificant differences

students who live in the country, in small towns and in the big city of a rural region without much industry was similar. The study was conducted in Olsztyn and in selected towns of the Suwałki region, which were typical of the north-eastern Poland when taking into consideration low industrial development. The small towns in the region included Suwałki and Sejny, while the villages – Przerośl and Dowspuda.

The basic information characterising each group was gathered in individual interviews. The food patterns were determined based on the frequency of food consumption and 24-h recall [Charzewska *et al*., 1997; Szponar *et al*., 2000]. The energy and nutritional values of the diets were calculated [Kunachowicz *et al.,* 1998; Nadolna *et al.,* 1994] and then compared to the safe level of dietary standards (Dietary Reference Intake – DRI) for young people from the relevant age groups with low level of physical activity [Ziemlański *et al.,* 1994], and for cholesterol and dietary fibre – with nutrition prevention recommendations, 27 g and 300 mg, respectively [WHO, 1990].

Factor analysis was applied to the data about the frequency of consuming 21 products, which resulted in identifying 8 food patterns typical of young people [Waluś *et al.,* 2006a; Newby *et al.,* 2004].

The procedure and methods was described in detail in the previous paper [Waluś *et al.,* 2006b].

Further analysis was conducted in the group of 178 girls. Three characteristic food patterns were selected based on their effect on the nutritional and energy value of the girls' diets. These were: alcohol (food pattern II), legumes, fish and beef (food pattern V) and margarine (food pattern VII). Quintile ranges of the frequency of consuming the products which together make up the common food pattern were established for each food pattern (Q1, Q2, Q3, Q4 and Q5). Then, in each quintile, the mean frequency of consuming each product (times/day), mean energy and nutritional value was calculated. For each food pattern, the trends of the food consuming frequency, its energy and nutritional value in the quintiles of food consumption frequency were analysed with the linear regression analysis, establishing the level of significance for a trend. The statistical analysis was conducted with the use of Statistica PL v.7.1.

RESULTS

For food pattern II, describing the frequency of alcohol consumption, a significant increase in the frequency of wine consumption (p=0.047) and a growing tendency in the frequency of vodka consumption (p=0.069) (Table 1) was ob-

TABLE 2. Energy and nutritional value of diets of girls in quintiles of frequency of alcohol consumption.

Nutrient	Total		Quintiles of frequency of alcohol consumption										p of the trend
			Q1 (lowest)		Q2		Q3		Q4		Q5 (highest)		
	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	
Energy (kcal)	2052±636	95.8	2005±555	93.7	2155±733	100.5	2177±757	101.6	1915±451	89.4	1925±599	89.9	NS
Total protein (g)	66.1±22.5	132.1	64.8±19.5	129.7	72.0±27.3	144.1	65.7±26.2	131.5	61.8±17.2	123.7	63.8±21.0	127.6	NS
Animal protein (g)	40.6±17.4	-	40.5±14.5	-	43.3±20.1	-	38.7±19.6	-	39.1±16.5	-	41.2±19.0	-	NS
Fat (g)	82.4±30.6	105.2	79.9±31.7	102.4	86.4±28.3	110.3	85.2±34.2	108.6	83.2±24.7	106.2	73.0±30.6	93.3	NS
Cholesterol* (mg)	348±213	115.9	347±199	115.5	380±194	126.8	288±134	95.9	381±278	127.0	340±280	113.3	NS
Carbohydrates (g)	277±96	89.4	271±79	87.5	288±108	93.2	302±110	97.6	246±87	79.3	267±90	86.2	NS
Fiber* (g)	17.1±7.1	63.3	16.1±5.9	59.7	18.2±8.1	67.4	17.4±7.7	64.3	17.2±6.1	63.6	15.7±7.4	58.3	NS
Ca (mg)	599±364	54.4	547±325	49.7	667±383	60.7	629±447	57.2	566±371	51.4	634±266	57.6	NS
P (mg)	1097±400	137.2	1076±319	134.5	1188±505	148.5	1114±490	139.2	1035±266	129.4	1050±406	131.3	NS
Mg (mg)	246±115	77.8	239±93	75.6	267±144	84.6	256±126	80.7	225±72	70.9	243±146	76.7	NS
Fe (mg)	9.8±5.6	65.5	10.5±7.0	70.2	11.5±7.2	76.5	9.0±3.5	60.0	8.6±3.1	57.5	8.5±3.3	57.0	0.084
Zn (mg)	8.8±3.3	87.9	9.0±3.0	90.0	9.6±4.0	95.7	8.6±3.7	86.3	8.2±2.5	82.3	8.2±3.4	81.6	0.091
Cu (mg)	0.96±0.41	54.8	0.99±0.37	56.7	1.00±0.46	56.9	1.02±0.45	58.2	0.83±0.29	47.4	0.92±0.47	52.6	NS
K (mg)	2447±941	97.9	2425±723	97.0	2523±1122	100.9	2427±1154	97.1	2407±857	96.3	2374±853	95.0	NS
Vitamin A (μg)	1119±2638	186.5	1798±3879	299.7	1240±3474	206.7	706±508	117.6	785±616	130.9	535±272	89.1	0.025
Vitamin E (mg)	8.13±4.06	101.6	8.77±4.39	109.6	8.05±3.26	100.6	8.51±4.09	106.3	7.79±3.86	97.4	6.14±3.13	76.8	0.070
Vitamin B_1 (mg)	1.14±0.56	81.6	1.05±0.47	75.9	1.29±0.60	92.5	1.04±0.49	74.4	1.19±0.57	85.1	1.03±0.72	74.2	NS
Vitamin B_2 (mg)	1.38±0.78	73.2	1.49±1.03	78.9	1.53±0.94	80.8	1.32±0.56	69.4	1.23±0.45	65.0	1.27±0.43	67.4	0.054
Vitamin PP (mg)	12.5±7.1	69.3	14.0±7.0	77.6	13.3±9.1	73.9	11.0±6.2	60.9	11.7±5.9	65.0	9.7±5.2	53.7	0.024
Vitamin B_6(mg)	1.60±0.69	100.3	1.68±0.52	105.5	1.62±0.89	102.1	1.47±0.76	92.4	1.60±0.60	100.3	1.45±0.67	91.3	NS
Vitamin C (mg)	37.5±40.1	62.5	34.5±27.9	57.5	33.8±30.1	56.3	36.4±30.7	60.7	42.0±44.1	70.0	48.4±80.9	80.6	0.024
SFA (g)	32.7±15.2	-	30.2±14.5	-	34.9±14.2	-	35.0±18.4	-	32.9±13.5	-	30.4±15.0	-	NS
MUFA (g)	33.2±13.3	-	32.9±14.1	-	34.4±11.9	-	33.4±13.3	-	34.0±12.8	-	28.6±12.9	-	NS
PUFA (g)	10.0±4.8	142.7	10.8±5.3	154.0	10.1±4.8	143.6	9.8±4.4	139.7	9.8±4.8	140.5	8.0±4.5	114.7	0.042

* compared to nutritional prevention recommendations, SFA – saturated fatty acids, MUFA – monounsaturated fatty acids, PUFA – polyunsaturated fatty acids, x̄ – mean value, SD – standard deviation, DRI – dietary reference intake, p – level of significance, NS – insignificant differences

TABLE 3. The frequency of consuming 21 products by girls in quintiles of frequency of legumes, fish and beef consumption.

Products	Frequency of consumption (times/day)						
	Total	Quintiles of frequency of legumes, fish and beef consumption					
		Q1 (lowest)	Q2	Q3	Q4	Q5 (highest)	p of the trend
	x̄±SD	x̄±SD	x̄±SD	X̄±SD	x̄±SD	x̄±SD	
Beef*	0.08±0.108	0.04±0.052	0.04±0.053	0.11±0.098	0.10±0.110	0.14±0.184	0.025
Beer	0.03±0.076	0.01±0.034	0.01±0.035	0.02±0.053	0.02±0.055	0.08±0.162	NS
Butter	1.63±1.072	2.19±1.024	1.66±0.834	1.58±1.131	1.64±1.069	1.04±1.033	0.038
Chips and other hot snacks	0.14±0.199	0.11±0.093	0.10±0.068	0.18±0.261	0.09±0.060	0.27±0.341	NS
Crisps and other salted snacks	0.35±0.561	0.48±0.695	0.22±0.254	0.33±0.491	0.30±0.562	0.39±0.571	NS
Fish*	0.14±0.155	0.06±0.055	0.07±0.048	0.10±0.065	0.18±0.115	0.34±0.252	0.031
Fruit	1.21±0.897	1.32±1.039	1.15±0.844	1.16±0.855	1.22±0.845	1.11±0.931	NS
Fruit juices	0.70±0.781	0.89±0.949	0.51±0.568	0.75±0.717	0.63±0.770	0.62±0.790	NS
Legumes*	0.11±0.148	0.05±0.049	0.07±0.048	0.09±0.057	0.11±0.084	0.30±0.306	0.071
Margarine	0.43±0.734	0.61±0.885	0.33±0.469	0.44±0.800	0.34±0.615	0.30±0.667	NS
Milk	0.92±0.851	0.86±0.823	0.76±0.686	0.93±0.816	1.17±0.998	0.94±1.034	NS
Pork	0.41±0.497	0.39±0.603	0.44±0.397	0.36±0.499	0.58±0.547	0.30±0.393	NS
Poultry	0.46±0.443	0.56±0.611	0.47±0.368	0.38±0.325	0.53±0.475	0.36±0.342	NS
Raw vegetables	0.75±0.657	0.67±0.712	0.76±0.573	0.59±0.460	0.92±0.740	0.98±0.847	NS
Sweet drinks	0.61±0.670	0.87±0.778	0.46±0.491	0.55±0.590	0.73±0.798	0.45±0.638	NS
Sweets	0.82±0.753	1.18±0.850	0.77±0.789	0.74±0.558	0.69±0.743	0.56±0.616	0.041
Vegetable juices	0.75±0.657	0.67±0.712	0.76±0.573	0.59±0.460	0.92±0.740	0.98±0.847	NS
Vodka	0.01±0.023	0.00±0.006	0.00±0.004	0.00±0.006	0.00±0.006	0.02±0.058	NS
Wholemeal bread	0.63±0.800	0.79±0.861	0.76±1.087	0.47±0.658	0.62±0.524	0.49±0.697	NS
Wine	0.01±0.017	0.00±0.007	0.00±0.005	0.01±0.008	0.00±0.007	0.01±0.042	NS
Yogurt	0.49±0.498	0.65±0.584	0.40±0.414	0.50±0.457	0.40±0.341	0.49±0.661	NS

* the products which make up food pattern V, x – mean value, SD – standard deviation, p – level of significance, NS – insignificant differences

served. No increasing trends in the frequency of beer consumption were shown in the subsequent quintiles of the frequency of alcohol consumption ($p>0.1$). In Q5, the frequency of wine consumption was average 0.02 times/day (about once a two month), for vodka the number was average 0.03 times/day (about once a month), and for beer it was average 0.18 times/day (about five times a month). The growing frequency of alcohol consumption was accompanied by a significant increase in the frequency of chips' and other hot snacks consumption and a significant decrease in the frequency of poultry and margarine consumption, although the three products did not make up a food pattern. Furthermore, a decreasing tendency was shown to exist in the frequency of consuming wholemeal bread and sweets (Table 1).

Regardless of the frequency of consuming the foods in question, the girls' diets conformed to the recommendations concerning: energy, fat, potassium and vitamin B_6, and contained too much total protein, cholesterol and phosphorus. Too low consumption was observed in the case of calcium, magnesium, iron, copper, vitamin B_2, vitamin PP, vitamin C and fibre (Table 2).

An increase in the frequency of alcohol consumption was accompanied by a significant decrease ($p<0.05$) in the intake of vitamin A, vitamin PP and PUFA and a significant increase in the intake of vitamin C (Table 2). Moreover, a increase in the frequency of alcohol consumption was associated with a decreasing trend ($p<0.1$) in the intake of iron, zinc, vitamin E and vitamin B_2.

In the consecutive quintiles of the frequencies of consuming the foods which make up food pattern V, a significant increase in the frequency of beef ($p=0.025$) and fish ($p=0.031$) consumption was observed, and a growing tendency was shown to exist in the frequency of legumes consumption ($p=0.071$) (Table 3). In quintile five, as compared to quintile one, the frequency of beef consumption was 3.5 times higher, and that of fish and legumes consumption was about 6 times higher (Table 3). Also, an increase in the frequency of legumes, fish and beef consumption was accompanied by a significant decrease in the frequency of butter and sweets consumption. The increase in the frequency of legumes, fish and beef consumption resulted in a significant decrease ($p<0.05$) in the intake of fat, vitamin E, vitamin PP, MUFA and PUFA (Table 4).

For food pattern VII, which described the frequency of margarine consumption in consecutive quintiles of food consumption frequency, a significant decrease in the frequency of butter consumption was observed ($p=0.008$; Table 5). The frequency of margarine consumption was nearly 30 times

TABLE 4. Energy and nutritional value of diets of girls in quintiles of frequency of legumes, fish and beef consumption.

Nutrient	Total		Quintiles of frequency of legumes, fish and beef consumption										p of the trend
			Q1 (lowest)		Q2		Q3		Q4		Q5 (highest)		
	$\bar{x}$±SD	DRI (%)	$\bar{x}$±SD	DRI (%)	$\bar{x}$±SD	DRI (%)	$\bar{x}$±SD	DRI (%)	$\bar{x}$±SD	DRI (%)	$\bar{x}$±SD	DRI (%)	
Energy (kcal)	2052±636	95.8	2257±800	105.0	2017±464	94.6	1954±458	91.4	1983±665	92.5	2013±765	93.6	NS
Total protein (g)	66.1±22.5	132.1	74.5±28.8	149.1	65.5±18.5	130.9	59.7±17.7	119.3	67.1±26.4	134.2	63.5±18.2	127.0	NS
Animal protein (g)	40.6±17.4	-	46.1±19.0	-	39.2±17.5	-	36.7±15.2	-	43.0±20.7	-	38.1±14.7	-	NS
Fat (g)	82.4±30.6	105.2	91.4±36.2	115.6	81.4±22.6	105.4	80.1±23.6	102.6	80.7±30.4	103.0	75.4±38.4	95.5	0.048
Cholesterol* (mg)	348±213	115.9	351±174	117.2	397±265	132.3	362±211	120.6	327±238	108.9	267±143	89.0	NS
Carbohydrates (g)	277±96	89.4	300±118	96.9	271±81	87.8	263±72	84.9	262±101	84.6	285±109	92.0	NS
Fiber* (g)	17.1±7.1	63.3	18.7±7.7	69.3	17.2±6.4	63.7	15.5±5.9	57.4	16.2±7.7	60.0	17.6±7.4	65.2	NS
Ca (mg)	599±364	54.4	687±447	62.5	549±295	49.9	565±337	51.3	551±267	50.1	682±461	62.0	NS
P (mg)	1097±400	137.2	1244±521	155.4	1075±307	134.4	1011±297	126.4	1038±449	129.8	1132±413	141.4	NS
Mg (mg)	246±115	77.8	276±136	86.2	248±100	79.8	221±93	70.2	223±128	70.4	271±121	84.6	NS
Fe (mg)	9.8±5.6	65.5	12.2±8.6	81.4	9.7±4.4	64.5	9.0±4.2	60.1	8.5±3.8	56.4	9.6±4.5	64.3	NS
Zn (mg)	8.8±3.3	87.9	10.3±3.9	102.7	8.5±3.0	85.2	8.1±2.8	81.5	8.8±4.0	88.3	8.2±2.8	82.4	NS
Cu (mg)	0.96±0.41	54.8	1.14±0.53	65.2	0.92±0.32	52.7	0.90±0.31	51.6	0.83±0.37	47.3	0.99±0.44	56.8	NS
K (mg)	2447±941	97.9	2726±1081	109.1	2396±699	95.8	2262±806	90.5	2270±1119	90.8	2568±1004	102.7	NS
Vitamin A (μg)	1119±2638	186.5	2150±4865	358.4	726±472	121.0	973±2020	162.1	581±410	96.9	1066±2110	177.6	NS
Vitamin E (mg)	8.13±4.06	101.6	9.00±3.90	112.4	8.49±4.40	106.1	8.09±3.80	101.1	7.06±3.74	88.2	7.28±3.34	90.9	0.015
Vitamin B_1 (mg)	1.14±0.56	81.6	1.36±0.65	97.2	1.15±0.55	83.5	0.97±0.45	70.2	1.10±0.59	78.7	1.02±0.43	73.1	NS
Vitamin B_2 (mg)	1.38±0.78	73.2	1.74±1.28	91.8	1.28±0.43	67.9	1.26±0.55	66.9	1.27±0.51	66.9	1.40±0.74	73.7	NS
Vitamin PP (mg)	12.5±7.1	69.3	15.1±7.8	84.0	12.7±6.5	70.5	11.1±6.7	61.8	11.8±8.3	65.8	10.3±4.7	57.0	0.038
Vitamin B_6(mg)	1.60±0.69	100.3	1.82±0.63	113.6	1.57±0.55	99.4	1.47±0.68	92.6	1.49±0.96	93.2	1.57±0.59	98.2	NS
Vitamin C (mg)	37.5±40.1	62.5	38.5±23.4	64.1	37.9±37.3	63.2	36.0±34.9	60.0	27.4±24.6	45.6	50.5±75.7	84.2	NS
SFA (g)	32.7±15.2	-	36.0±18.8	-	31.3±9.5	-	31.4±13.4	-	33.6±13.0	-	31.6±20.5	-	NS
MUFA (g)	33.2±13.3	-	36.8±14.9	-	33.3±11.9	-	32.4±10.4	-	32.2±14.4	-	29.3±14.0	-	0.014
PUFA (g)	10.0±4.8	142.7	11.2±4.9	159.9	10.3±4.9	147.7	10.1±4.9	143.7	8.7±4.7	124.3	8.6±3.9	123.4	0.007

* compared to nutritional prevention recommendations, SFA – saturated fatty acids, MUFA – monounsaturated fatty acids, PUFA – polyunsaturated fatty acids, $\bar{x}$ – mean value, SD – standard deviation, DRI – dietary reference intake, p – level of significance, NS – insignificant differences

TABLE 5. The frequency of consuming 21 products by girls in quintiles of frequency of margarine consumption.

Products	Frequency of consumption (times/day)						
	Total	Quintiles of frequency of margarine consumption					
		Q1 (lowest)	Q2	Q3	Q4	Q5 (highest)	p of the trend
	$\bar{x}$±SD	$\bar{x}$±SD	$\bar{x}$±SD	$\bar{X}$±SD	$\bar{x}$±SD	$\bar{x}$±SD	
Beef	0.08±0.108	0.13±0.166	0.09±0.113	0.06±0.061	0.08±0.076	0.06±0.091	0.087
Beer	0.03±0.076	0.05±0.141	0.02±0.037	0.01±0.038	0.04±0.077	0.01±0.009	NS
Butter*	1.63±1.072	2.88±0.466	2.63±0.660	1.48±0.354	0.89±0.746	0.78±0.731	0.008
Chips and other hot snacks	0.14±0.199	0.25±0.360	0.17±0.198	0.09±0.094	0.13±0.095	0.10±0.126	0.084
Crisps and other salted snacks	0.35±0.561	0.51±0.775	0.34±0.520	0.22±0.182	0.23±0.186	0.43±0.696	NS
Fish	0.14±0.155	0.15±0.153	0.13±0.143	0.10±0.116	0.13±0.127	0.15±0.197	NS
Fruit	1.21±0.897	1.21±0.837	1.42±1.005	1.33±0.927	0.90±0.788	1.22±0.907	NS
Fruit juices	0.70±0.781	0.82±0.765	0.99±0.908	0.59±0.833	0.59±0.681	0.52±0.607	NS
Legumes	0.11±0.148	0.12±0.259	0.14±0.120	0.08±0.065	0.10±0.098	0.11±0.148	NS
Margarine*	0.43±0.734	0.05±0.142	0.11±0.136	0.11±0.162	0.29±0.362	1.44±0.954	NS
Milk	0.92±0.851	0.89±0.851	1.26±0.986	0.91±0.833	0.66±0.665	0.95±0.904	NS
Pork	0.41±0.497	0.30±0.384	0.45±0.631	0.40±0.387	0.41±0.395	0.50±0.643	NS
Poultry	0.46±0.443	0.29±0.303	0.58±0.610	0.41±0.283	0.49±0.420	0.51±0.469	NS
Raw vegetables	0.75±0.657	0.77±0.638	1.03±0.796	0.60±0.442	0.62±0.591	0.77±0.738	NS
Sweet drinks	0.61±0.670	0.47±0.574	0.76±0.851	0.38±0.378	0.47±0.394	0.99±0.857	NS
Sweets	0.82±0.753	0.96±0.810	1.04±0.861	0.58±0.629	0.59±0.634	0.92±0.680	NS
Vegetable juices	0.45±0.640	0.47±0.741	0.67±0.943	0.40±0.580	0.38±0.383	0.36±0.497	NS
Vodka	0.01±0.023	0.02±0.052	0.00±0.007	0.00±0.004	0.00±0.006	0.00±0.006	NS
Wholemeal bread	0.63±0.800	0.67±0.978	0.85±1.048	0.43±0.644	0.49±0.523	0.72±0.759	NS
Wine	0.01±0.017	0.01±0.038	0.00±0.007	0.00±0.008	0.00±0.007	0.00±0.007	NS
Yogurt	0.49±0.498	0.67±0.550	0.70±0.764	0.37±0.326	0.34±0.258	0.46±0.408	NS

* the products which make up food pattern VII, $\bar{x}$ – mean value, SD – standard deviation, p – level of significance, NS – insignificant differences

higher in quintile five than in quintile one; however, no trend was confirmed in the frequency of the consumption of the product. In consecutive quintiles of margarine consumption frequency, a decreasing trend ($p<0.1$) was found to exist in the frequency of chips and other hot snacks and beef consumption. In consecutive quintiles of margarine consumption frequency, a significant decrease ($p<0.05$) was observed in the intake of energy, potassium, vitamin C and MUFA (Table 6). A decreasing tendency was observed in the fat and fibre intake.

DISCUSSION

This study has shown that regardless of the frequency of consuming the food in question, the girls' diets had the correct average energy value as well as potassium, vitamin E and vitamin B_6 content, but they contained too much total protein, cholesterol, PUFA and phosphorus. Moreover, compared to DRI, they contained slightly more fat than carbohydrates, but the amounts still conformed to the recommendations. An adverse feature of the diets was that they contained too little of most vitamins, minerals and fibre, the fact being linked to low frequencies of consuming wholemeal bread, vegetables, fruit and dairy products [Cavadini *et al.,* 1999]. The correct level of consumption of fat, carbohydrates and energy may have been linked to relatively high frequencies of consuming chips and other hot snacks, sweets, sweet drinks and pork, which may be a good source of energy, but cannot provide sufficient amounts all nutrients. It has been shown in numerous studies that consuming too much of such products favours obesity and may increase the risk of heart attack, diabetes, hypertension, atherosclerosis and ischaemic heart disease [Hu, 2003; Newby *et al.,* 2004].

Contrary to expectations, the increase in the frequency of consuming legumes, fish and beef did not affect the nutritional value of the girls' diets. Conversely, despite the increase in the frequency of fish consumption, a significant drop in PUFA intake was observed, accompanied by a reduction in MUFA and total fat intake, with SFA intake unchanged. The amounts of vitamin E and PP were shown to have been significantly reduced. It must be stressed that the PUFA intake was high and in excess of DRI in all the quintiles of the frequency of consuming the foods in question. The total fat and MUFA content in the girls' diets may have resulted from lower frequencies of consuming butter and sweets, particularly high-fat ones, and an increased frequency of beef consumption, which is low fat food. The results indicate that an increase in the frequency of consuming legumes, fish and

TABLE 6. Energy and nutritional value of diets of girls in quintiles of frequency of margarine consumption.

Nutrient	Total		Quintiles of frequency of margarine consumption										p of the trend
			Q1 (lowest)		Q2		Q3		Q4		Q5 (highest)		
	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	x̄±SD	DRI (%)	
Energy (kcal)	2052±636	95.8	2126±764	99.1	2055±566	96.0	2027±420	95.4	2034±565	94.8	2003±795	93.2	0.038
Total protein (g)	66.1±22.5	132.1	65.8±29.2	131.6	66.6±13.1	133.2	65.7±20.2	131.5	66.2±22.7	132.4	65.3±25.8	130.5	NS
Animal protein (g)	40.6±17.4	-	40.2±22.6	-	41.0±13.0	-	40.8±17.8	-	40.0±17.7	-	40.8±17.0	-	NS
Fat (g)	82.4±30.6	105.2	86.0±37.7	109.4	83.1±28.1	106.4	85.5±22.2	111.2	80.2±24.5	101.9	77.9±36.6	98.6	0.054
Cholesterol* (mg)	348±213	115.9	359±232	119.6	379±273	126.4	337±163	112.2	307±163	102.4	367±234	122.2	NS
Carbohydrates (g)	277±96	89.4	290±110	93.5	275±101	88.9	264±63	85.6	276±87	89.2	275±113	88.6	NS
Fiber* (g)	17.1±7.1	63.3	19.7±8.9	73.0	16.8±5.8	62.3	16.4±5.1	60.9	16.1±7.0	59.7	16.2±7.2	59.9	0.096
Ca (mg)	599±364	54.4	619±384	56.3	626±353	56.9	597±409	54.3	653±295	59.3	516±407	46.9	NS
P (mg)	1097±400	137.2	1121±522	140.1	1073±248	134.2	1077±321	134.6	1135±414	141.9	1074±464	134.2	NS
Mg (mg)	246±115	77.8	265±158	83.1	241±90	76.1	241±85	78.0	254±130	79.7	232±99	72.5	NS
Fe (mg)	9.8±5.6	65.5	10.0±5.0	66.9	9.0±2.5	59.8	8.4±2.0	56.2	9.6±5.1	64.0	12.0±9.3	80.1	NS
Zn (mg)	8.8±3.3	87.9	9.2±4.3	92.5	8.7±2.2	86.9	8.7±3.2	87.1	8.4±3.1	84.2	9.1±3.8	90.9	NS
Cu (mg)	0.96±0.41	54.8	1.04±0.49	59.4	0.96±0.37	55.0	0.88±0.23	50.3	0.93±0.44	53.1	0.99±0.45	56.8	NS
K (mg)	2447±941	97.9	2772±1343	110.9	2539±841	101.6	2402±679	96.1	2280±828	91.2	2267±885	90.7	0.011
Vitamin A (μg)	1119±2638	186.5	1222±2400	203.7	625±302	104.1	734±535	122.3	528±264	88.0	2533±5176	422.2	NS
Vitamin E (mg)	8.13±4.06	101.6	7.65±3.67	95.6	8.60±4.32	107.5	7.90±3.57	98.8	7.15±3.13	89.4	9.28±4.60	116.0	NS
Vitamin B_1 (mg)	1.14±0.56	81.6	1.22±0.53	87.7	1.07±0.47	77.0	1.11±0.58	80.8	1.11±0.63	79.9	1.10±0.55	78.9	NS
Vitamin B_2 (mg)	1.38±0.78	73.2	1.45±0.73	76.8	1.31±0.35	69.3	1.25±0.45	66.5	1.35±0.49	71.4	1.58±1.40	83.1	NS
Vitamin PP (mg)	12.5±7.1	69.3	13.2±8.5	73.1	11.8±4.6	65.6	11.9±6.0	65.9	10.3±6.0	57.5	14.7±8.9	81.9	NS
Vitamin B_6(mg)	1.60±0.69	100.3	1.79±0.98	112.0	1.63±0.57	102.3	1.58±0.57	100.1	1.37±0.62	85.9	1.62±0.62	101.5	NS
Vitamin C (mg)	37.5±40.1	62.5	57.4±67.1	95.6	40.1±37.2	66.8	34.6±27.3	57.7	29.2±32.7	48.7	30.4±22.7	50.7	0.041
SFA (g)	32.7±15.2	-	33.9±19.0	-	31.9±12.5	-	35.2±11.8	-	33.5±11.3	-	29.5±19.6	-	NS
MUFA (g)	33.2±13.3	-	35.4±15.8	-	33.6±14.0	-	34.4±9.8	-	31.3±11.6	-	31.4±13.7	-	0.039
PUFA (g)	10.0±4.8	142.7	10.0±5.2	142.4	10.8±5.3	154.3	9.4±3.6	134.8	8.9±4.3	127.3	10.8±5.2	154.2	NS

* compared to nutritional prevention recommendations, SFA – saturated fatty acids, MUFA – monounsaturated fatty acids, PUFA – polyunsaturated fatty acids, x̄ – mean value, SD – standard deviation, DRI – dietary reference intake, p – level of significance, NS – insignificant differences

beef may have both positive and negative effects on the nutritional value of the girls' diets. Among the positive effects of the increase in the frequency of legumes, fish and beef consumption was the decrease in total fat, while the negative effects included a reduction of the intake of some vitamins and changing the relation between fatty acids – reducing the amounts of MUFA and PUFA, with SFA unchanged. Such characteristics of the nutritional value of the food pattern does not provide grounds for its positive evaluation and acknowledging its pro-health properties.

An increase in the frequency of alcohol consumption had the greatest contribution in decreasing the nutritional value of the girls' diets. A significant decrease or a decreasing tendency has been found in the amounts of many vitamins and minerals, including vitamins A, PP, E and B_2, as well as iron, zinc and PUFA. Only the vitamin C intake significantly rose, yet it still remained below the recommended level (about 80% DRI). The observed changes in the nutritional value of the girls' diets were related to the changes in the frequencies in consuming other products. An increase in the frequency of alcohol consumption was accompanied by an increase in the frequency of consuming chips and other hot snacks and a decrease in the frequency of consuming poultry and margarine; a decreasing trend was also observed in the frequency of consuming wholemeal bread and sweets. The results indicate that an increasing frequency of drinking alcohol was accompanied by other adverse changes in eating habits, such as an increase in the frequency of eating high fat snacks and a decrease in the frequency of consuming low fat meat products and wholemeal bread. It confirms the findings of other authors concerning the adverse effect of alcohol consumption on eating habits and on reducing a diet's nutritional value [Weeb *et al.,* 1997].

An increase in the frequency of consuming margarine was closely related to a decrease in the frequency of consuming butter, therefore, the changes in the nutritional value of the girls' diets have to be considered as the product of changes in the consumption of both bread spreads and the decreasing trend in the frequency of consuming red meat and high fat snacks. The observed changes in the nutritional value indicate that the increase in the frequency of margarine consumption and the drop in the frequency of butter consumption resulted in the reduction of the amount of high fat food with the concurrent adverse reducing of the consumption of plant food products, which is indicated by the decrease in the amount of potassium, vitamin C and fibre. The results signify that replacing butter with margarine, thought to be a positive behaviour [Kołłajtis-Dołowy *et al.,* 2005], resulted in a decrease in the energy and nutritional value of the girls' diets. The underlying cause of those adverse changes was probably the reduction of consuming both high fat foods and food products of plant origin. This provides grounds for the conclusion that single characteristics of nutrition, such as low level of butter consumption, are not sufficient for expressing opinions about the pro-health features of such a food pattern.

CONCLUSIONS

None of the food patterns analysed in this study had the correct nutritional value or pro-health characteristics. An increase in the frequency of consuming legumes, fish and beef, an increase in the frequency of consuming alcohol or an increase in the frequency of consuming margarine with a concurrent decrease in the frequency of consuming butter resulted in reduction of the amounts of many vitamins, minerals and fibre in the girls' diets. A growing frequency of alcohol consumption was accompanied by other undesired eating habits, such as increasing consumption of high fat snacks or a decrease in the consumption of low fat meat products and wholemeal bread. As the frequency of consuming margarine increased, the energy value of the diet decreased, and the decrease in the frequency of legumes, fish and beef consumption was associated with the reduction of fat and, paradoxically, PUFA in the diet. The results indicate that an increase in the frequency of consuming the food under study resulted in decreasing the nutritional value of the girls' diets and was caused by their being less varied.

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ANALIZA WARTOŚCI ODŻYWCZEJ RACJI POKARMOWYCH MŁODZIEŻY O ODMIENNYCH WZORACH ŻYWIENIOWYCH. CZĘŚĆ II. WZORY ŻYWIENIOWE DZIEWCZĄT

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Analizowano wartość odżywczą racji pokarmowych dziewcząt o trzech odmiennych wzorach żywieniowych, które wyrażały się różną częstością spożycia alkoholu, strączkowych, ryb i mięsa wołowego oraz margaryny i masła. Badaniami objęto 178 dziewcząt w wieku 15-18 lat ze szkół średnich o różnych profilach, zlokalizowanych w regionie suwalskim i mieście Olsztynie. Na podstawie informacji o częstości spożycia 21 produktów za pomocą analizy czynnikowej wyodrębniono 8 charakterystycznych wzorów żywieniowych młodzieży. Dalszej analizie poddano 3 wybrane wzory żywieniowe. Były to: alkohole (wzór żywieniowy II), strączkowe, ryby i mięso wołowe (wzór żywieniowy V) oraz margaryna (wzór żywieniowy VII). Żaden z analizowanych wzorów żywieniowych dziewcząt nie miał prawidłowej wartości odżywczej ani cech prozdrowotnych. Wzrost częstości spożycia strączkowych, ryb i mięsa wołowego, wzrost częstości spożycia alkoholu lub wzrost częstości spożycia margaryny przy jednoczesnym spadku częstości spożycia masła były związane z obniżeniem zawartości wielu witamin, składników mineralnych i błonnika w dietach dziewcząt (tabela 1-6). Rosnącej częstości spożycia alkoholi towarzyszyły inne niepożądane zwyczaje żywieniowe, takie jak wzrost częstości spożycia tłustych przekąsek oraz spadek częstości spożycia niskotłuszczowych produktów mięsnych i pieczywa razowego. Wraz ze wzrostem częstości spożycia margaryny stwierdzono obniżenie wartości energetycznej diet dziewcząt, a wzrost częstości spożycia strączkowych, ryb i mięsa wołowego był związany ze spadkiem zawartości tłuszczu i paradoksalnie ilości PUFA. Uzyskane wyniki sugerują, że wzrost częstości spożycia alkoholu, strączkowych, ryb, mięsa wołowego i margaryny wpływał na obniżenie wartości odżywczej diet dziewcząt i był rezultatem ich mniejszego urozmaicenia.