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Quality assessment of a daily diet for 1st grade in elementary school children in Bydgoszcz

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Summary

The aim of the dissertation was analysis and assessment of eating manner of 1st grade children from 5 elementary schools in Bydgoszcz.

The analyzed group consisted of 85 students attending to 2012/2013 school year to 1st grade of 5 elementary schools in Bydgoszcz. Data concerning products, meals and beverages consumption were obtained for each person. The quality assessment of daily menus was carried out via two methods: the Bielińska's and Szczygłowa's method. The statistical analysis was performed at a significance level of $p \leq 0.05$.

The assessment by Szczygłowa's method has shown 3% of appropriate menus and 17% of satisfactory menus. High percentage of unsatisfactory menus were stated (80%). Through Bielińska's method there were 37% of good menus, 48% required improvement and 15% were inappropriate. The analysis of particular Bielińska's assessment criteria has depicted that over 90% of menus contained, recommended for children, amount of 4-5 meals and proper breaks between meals. Unfortunately, less the half of menus contained vegetables/fruit in 3 meals, and only 20% - wholemeal bread, groats and pulses. Under 80% and 75% of menus contained properly raw vegetables/fruit at least once a day and minimum of 2 portions of diary products. The quality assessment has shown the differences in nutrition quality between sex groups and analyzed schools (≤ 0.05). Appropriate and satisfactory menus according to Szczygłowa almost 3 times more frequently appeared in boys' than girls' menus.

1. Quality assessment of menus among 1st grade in elementary school children in Bydgoszcz has indicated inaccuracies in their content.
2. Differences in quality between boys' and girls' menus and between analyzed schools have been stated.
3. Indicated inaccuracies in menus' content point out the risk of minerals and vitamins shortage in children' nutrition.

Keywords: child nutrition, the quality of nutrition, qualitative assessment

Introduction

The condition of child's nutrition is determined by the manner of nutrition, nutritional value of consumed food and physical activity (Kostecka [1]; Jończyk [2]; Kaphingst K., Story M. [3]). Factors influencing the manner of eating are place of living (city, village), accompanying traditions and social-cultural habits. Factors such as sex and place where child studies, economical and legal status of a family and number of people in a household can also influence the manner of eating (Olejnik et al. [4]), and also a parents' belief when it comes to the optimal size of a meal (Łoś-Rycharska E., Niecławska A. [5]). The aim of the dissertation was to gain information concerning the quality assessment of eating manner among 1st grade in elementary school children in Bydgoszcz.

The aim of dissertation was the analysis and assessment of eating manner among 1st grade in elementary school children in Bydgoszcz.

Material and methods:

The analyzed group consisted of students attending to 2012/2013 school year to nine 1st grades of five elementary schools in Bydgoszcz. At four schools the analyzed group of students came from two, chosen randomly, 1st grades. At one school, in analyzed school year, was only one 1st grade. All analyzed grades participated in research project “Regional program preventing malnutrition, overweight and obesity through diet improvement of children from 1-3 grades in elementary schools (of 6-9 years old)”. The study group comprised of 113 people in total (60 boys and 53 girls).

The questionnaire was applied for the research, which was created for the purpose of population study as a part of research project “Regional program preventing malnutrition, overweight and obesity through diet improvement of children from 1st-3rd grades in elementary schools (of 6-9-year-olds)”. On the basis of the record concerning the consumed products, dishes and beverages from 3 days the quality of daily diet was evaluated. The aim of the record was to obtain information referring to what child has eaten and drunk during 3 days. Overall, 113 questionnaires were collected. 17 of them were rejected due to the lack of information concerning consumed products and dishes. Another 12 were eliminated due to the incomplete data about consumption. To the final analysis 256 of complete, full diets were taken into account. Diets received from boys amounted to 51% of collected data, and from girls 49%.

Diets were evaluated in accordance with two quality methods. The assessment of daily diets (DD) was created according to Szczygłowa (Tab. 1) and according to Bielińska (Tab. 2). The assessment of daily diets was carried out by defining the percentage of diets which fulfill or not the particular assessment criteria.

Tab. 1. Assessment of daily menus according to Szczygłowa's classification

Type of daily food	Number of daily meals	Number of meals containing		
		Animal protein	Simultaneously animal protein and fruit and vegetables	Milk or its products
Group I (proper nutrition)	≥ 4	≥ 4	≥ 3	≥ 1
Group II (satisfactory nutrition)	≥ 3	≥ 3	≥ 2	≥ 1
Group III (unsatisfactory nutrition)	≥ 3	≥ 2	≥ 1	≥ 1
Group IV (inappropriate nutrition)	Does not comply with one condition from group III			

Tab. 2. Assessment criteria of menus according to Bielińska's method

No.	Criterion	Yes (1) / No (0)
1.	Number of eaten meals 4-5 I	1 / 0
2.	Breaks between meals not longer than 5 hours	1 / 0
3.	Products of animal origin in at least 3 meals	1 / 0
4.	Milk and/or milk products in at least 2 meals	1 / 0
5.	Vegetables and fruit in at least 3 meals	1 / 0
6.	Raw vegetables and fruit in at least one meal	1 / 0
7.	Wholemeal bread, groats and pulses in at least one meal	1 / 0

Results:

The analysis of menus via Szczygłowa's method has shown that 3% of menus were proper, 17% were satisfactory, 44% were assessed as unsatisfactory, and 36% as inappropriate (Fig. 1). Among 5 analyzed schools, two of them have stood out - ES C (elementary school C) and ES E (elementary school E). At ES C 2/3 of menus achieved the highest rating (47% of proper menus and 19% of satisfactory menus), however at ES E there were only unsatisfactory (42%) and inappropriate (58%) menus (Fig. 2).

The analysis via Szczygłowa's method has indicated that boys' menus have obtained positive rating almost 3 times more frequently than girls' menus (proper and satisfactory nutrition; $p=0,001$; Fig. 3).

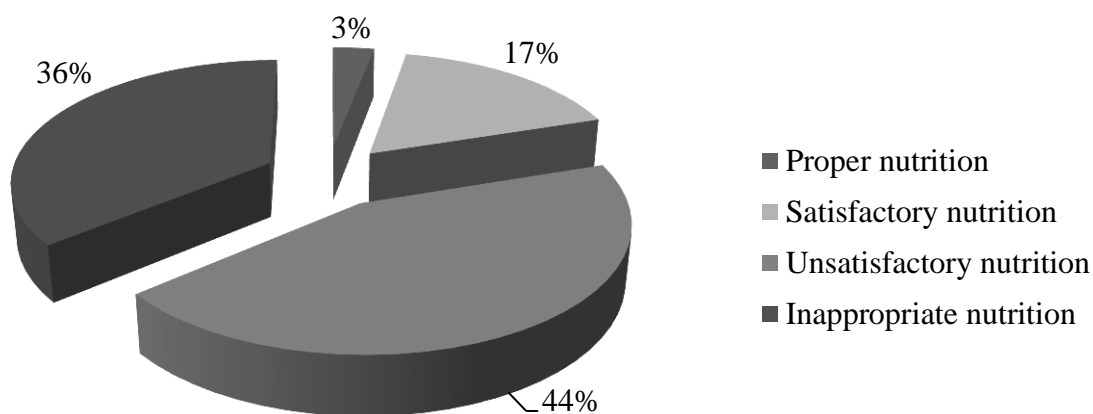


Fig. 1. Classification of menus of children from 1st grade in elementary schools in Bydgoszcz according to Szczygłowa's assessment

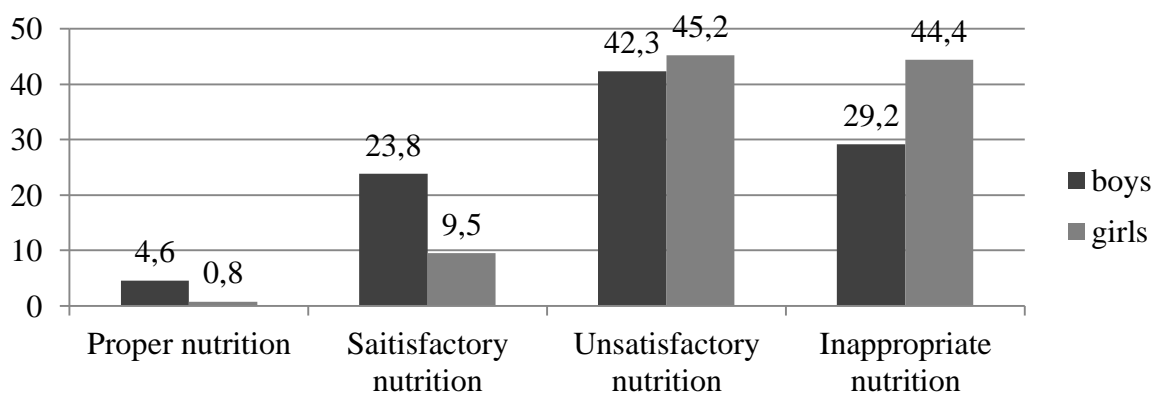


Fig. 2. Comparison of menus classification according to Szczygłowa's method in children sex groups ($p=0,001$)

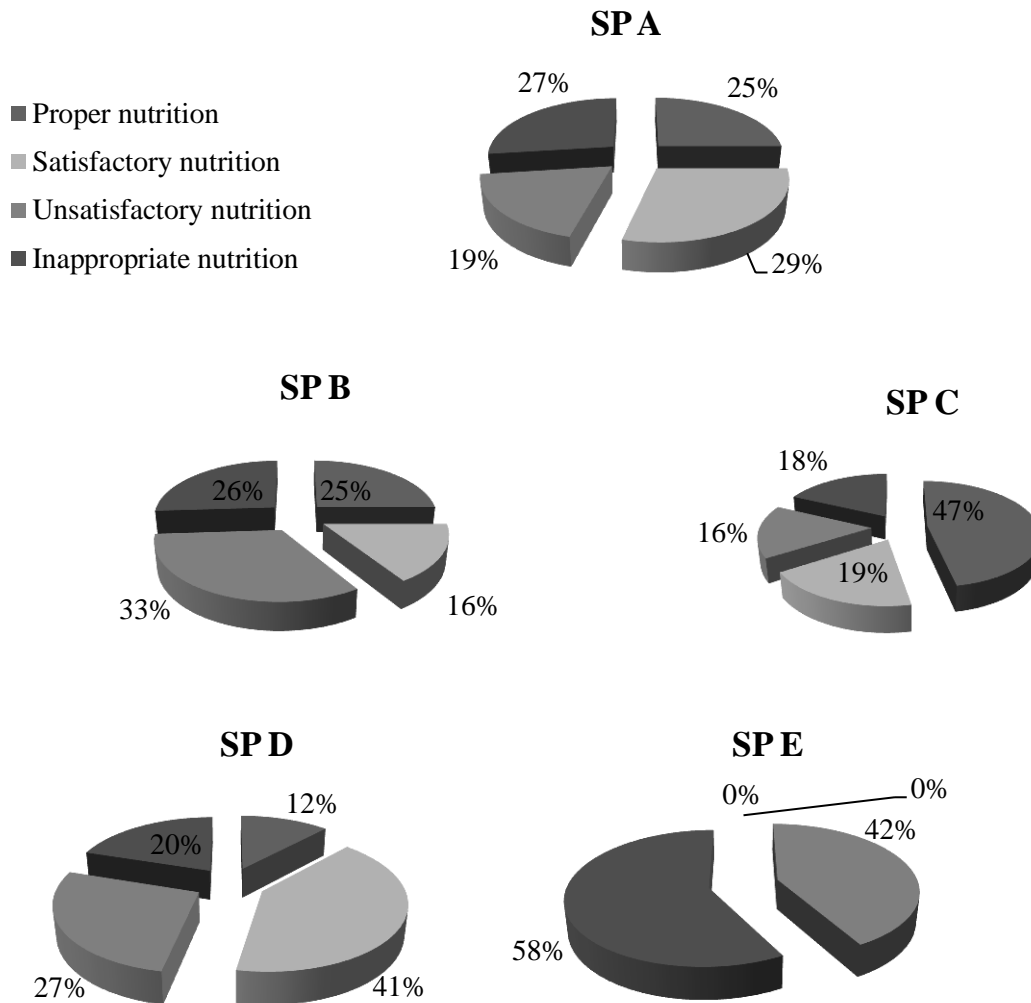


Fig. 3. Characteristics of menus according to Szczygłowa's assessment in selected elementary schools

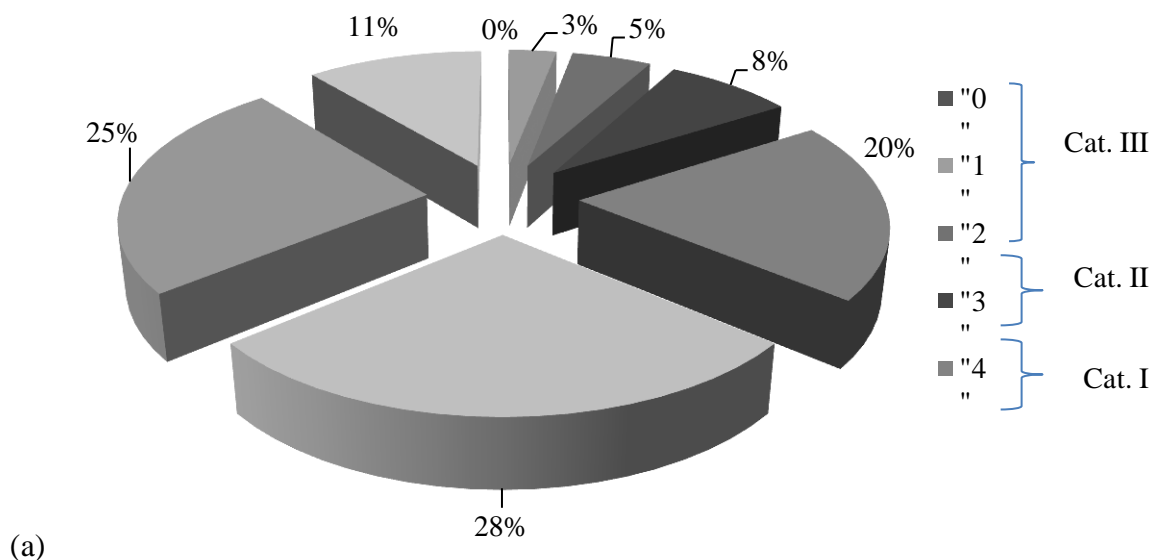
The analysis of selected criteria according to Bielińska has depicted that over 90% of menus contained recommended number of 4-5 meals for children and proper breaks between meals. Unfortunately, less than half of diets contained vegetables/fruit in 3 meals, and only 20% of them had wholemeal bread, groats and pulses. Almost 80% and 75% of menus included properly raw vegetables/fruit at least once a day and the minimum of 2 portions of milk products.

The evaluation of DD according to Bielińska through 7-point scale has demonstrated some dissimilarity from Szczygłowa's evaluation. The difference stemmed from the fact that milk and its products, in Bielińska's evaluation, fall within the group of "animal origin products", therefore higher percentage of menus have gained higher ratings 6 points – 25% of menus, 7 points – 11% of menus). The highest percentage of menus (28% of menus in total)

have obtained 5 mark. In order to ease the data analysis, the conversion of 7-point scale was applied into three categories. Menus assessed as 6 or 7 points were assigned to category I, 4 and 5 points to category II, from 0 to 3 points to category III (Fig. 4). According to the new scale 37% of menus were assessed as good, almost half of them (48%) required improvement, and 15% were inappropriate and contained many inaccuracies and required significant changes in order to improve the quality of nutrition.

The statistical analysis of menus assigned to three categories according to Bielińska's assessment, has shown relevant differences between menus of 5 schools in Bydgoszcz ($p=0,003$; Fig. 5). The highest percentage of good menus (52,4%) have been reported at ES D, at other schools, the percentage were lower and reached 38,6% of menus at ES C, approximately 27% at ES A and E and only 20% at ES C. The most beneficial quality of menus was achieved at ES D. The number of menus classified to category I was the highest at that school and inappropriate menus were only 10%. Meanwhile, inappropriate menus at ES B and C were 15,0%, at ES A 17% and at ES E about 30%.

Both, menus which were highly and low assessed (Fig. 6) have appeared more frequently in girls' nutrition ($p=0,04$). There were from 2 to 3 eating habits which required improvement in almost 50% of boys' menus.



(b)

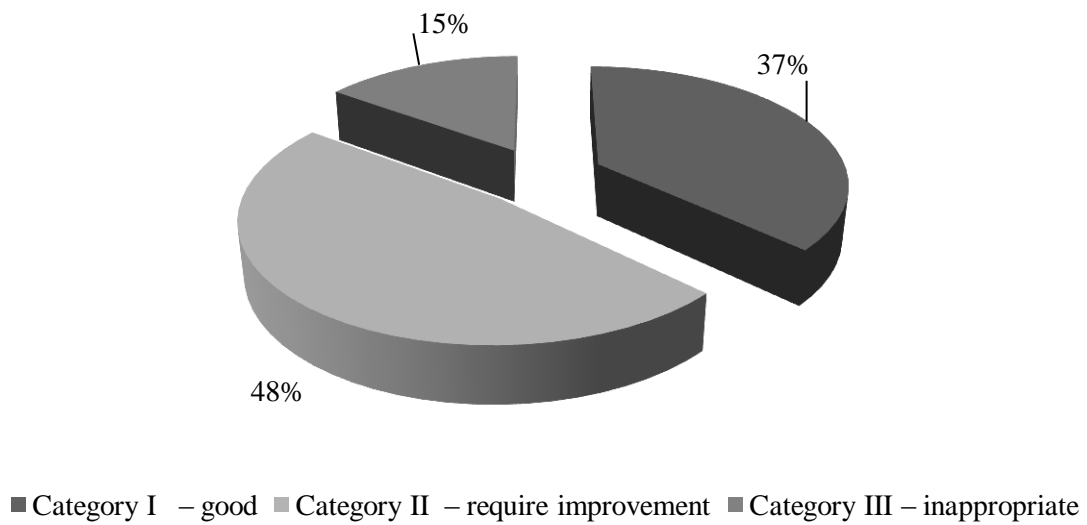


Fig. 4. Quality assessment according to Bielińska's method (a) and with the application of modification (categories I-III) (b)

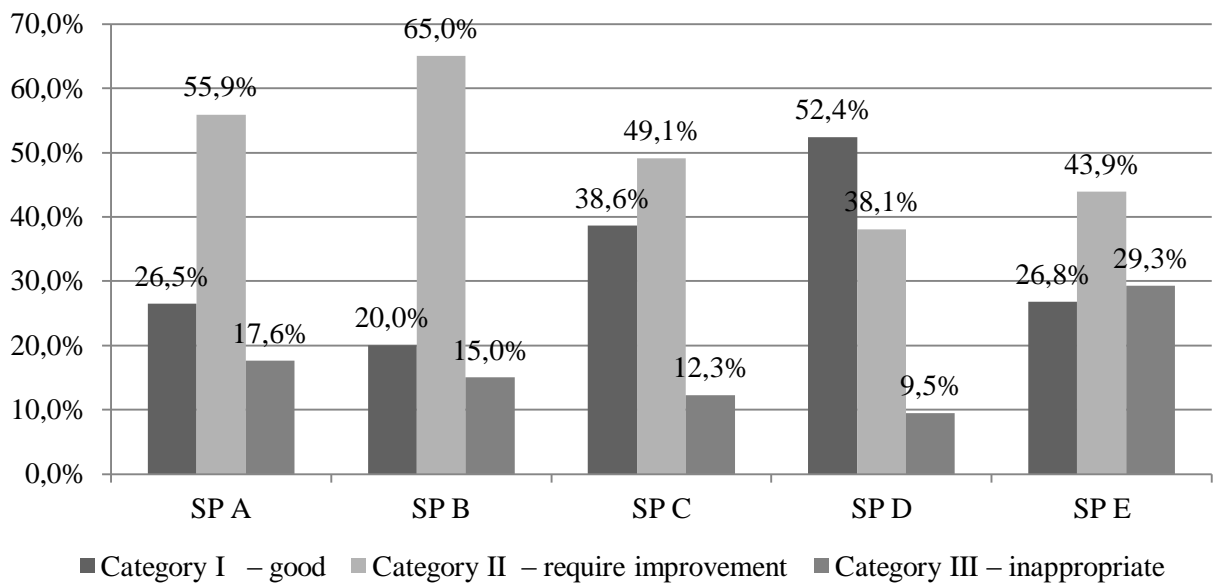


Fig. 5. Characteristics of menus according Bielińska's method with modification (3 categories I-III) at 5 elementary schools in Bydgoszcz ($p=0,04$)

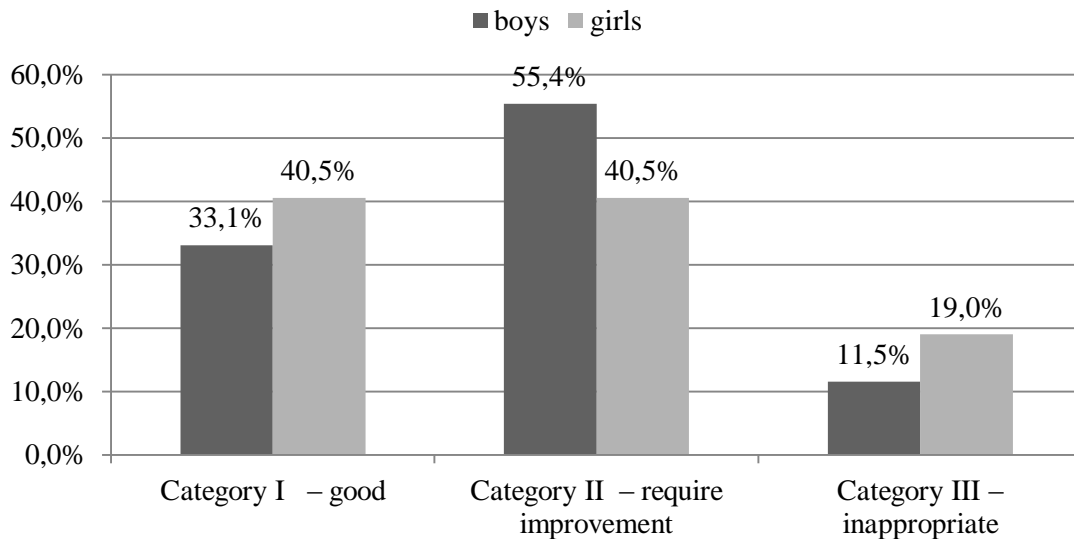


Fig. 6. Comparison of menus classification according to Bielińska's method with modification in children sex groups

The assessment of DD according to Bielińska (Jarosz [6]) allows to estimate the frequency of occurring menus containing, or not, particular products or group products (milk and/or milk products; animal protein; fruit and/or vegetables; raw fruit and/or vegetables; wholemeal bread, groats and pulses) and the frequency of consumed meals and the longness of breaks between meals (tab. 2). Approximately 90% of boys' and girls' menus had from 4 to 5 meals up to every 5 hours. Three meals containing animal protein were included in 53% of boys' menus and 47% in girls' menus, and the average for all 5 schools in Bydgoszcz was even lower – about 32%. More favorable statistics have been noted for the criterion of milk and/or milk products nutrition in at least two meals (boys 76,2%, girls 70,6 %, the average 73,4%) and vegetables and/or fruit in at least one meal (boys 77,7%, girls 81,7 %, the average 79,7%). Menus of the majority of boys, as well as girls (83,1% vs 76,2%), characterized with the lack of groats, rice, pulses and wholemeal bread.

The analysis of frequency of occurrence of at least 3 meals containing fruit and/or vegetables in children' menus, has shown the difference, which statistically significant, between boys' and girls' menus ($p=0,011$; Fig. 7) and between elementary schools in Bydgoszcz ($p=0,001$; Tab. 3). Differences of statistical significance, for other parameters of assessment via Bielińska's method, have not been identified.

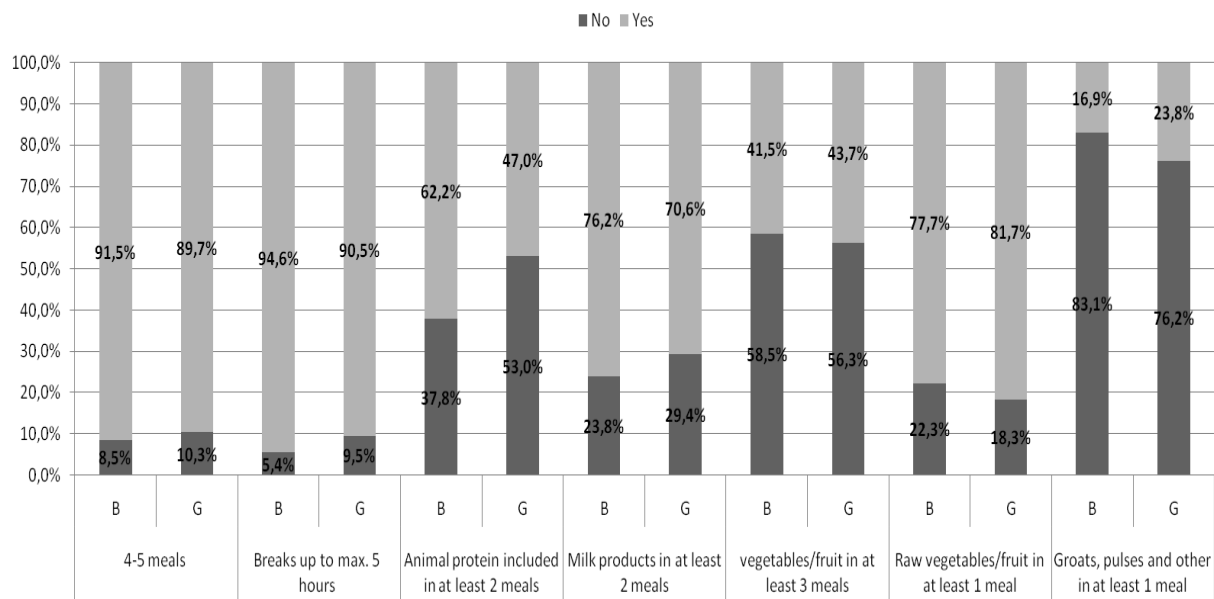


Fig.. 7. The frequency of fulfilling quality criteria of daily diets according to Bielińska's method in menus of boys and girls attending to 1st grade in elementary schools in Bydgoszcz (B- boys; G- girls).

Tab. 3. The frequency of fulfilling quality criteria of DD according to Bielińska's method in five elementary schools in Bydgoszcz

Assessment criterion	In total	Elementary school in Bydgoszcz					Pearson's Chi-Square Test	
		A	B	C	D	E		
Number of eaten meals 4-5	N	9,4%	5,9%	10,0%	12,3%	4,8%	17,1%	p=0,196
	Y	90,6%	94,1%	90,0%	87,7%	95,2%	82,9%	
Breaks between meals not longer than 5 hours	N	7,4%	2,9%	10,0%	5,3%	4,8%	17,1%	p=0,085
	Y	92,6%	97,1%	90,0%	94,7%	95,2%	82,9%	
Products of animal origin in at least 3 meals	N	68,0%	67,7%	55,0%	66,7%	70,2%	78,1%	p=0,263
	Y	32,0%	32,4%	45,0%	33,3%	29,8%	22,0%	
Milk and/or milk products in at least 2 meals	N	26,6%	41,2%	17,5%	28,1%	22,6%	29,3%	p=0,178
	Y	73,4%	58,8%	82,5%	71,9%	77,4%	70,7%	
Vegetables and fruit in at least 3 meals	N	57,4%	73,5%	77,5%	45,6%	46,4%	63,4%	p=0,001
	Y	42,6%	26,5%	22,5%	54,4%	53,6%	36,6%	
Raw vegetables and fruit in at least one meal	N	20,3%	26,5%	27,5%	14,0%	16,7%	24,4%	p=0,334
	Y	79,7%	73,5%	72,5%	86,0%	83,3%	75,6%	
Wholemeal bread, groats and pulses in at least one meal	N	79,7%	67,7%	90,0%	82,5%	75,0%	85,4%	p=0,095
	Y	20,3%	32,4%	10,0%	17,5%	25,0%	14,6%	

Y – yes – fulfilled criterion, N – no – unfulfilled criterion

During the study some inaccuracies have been demonstrated in nutrition of children of early childhood in five elementary schools chosen randomly. In assessment of DD with accordance to Szczygłowa's method, statistically significant differences were exhibited between boys' and girls' menus. Almost 3 times more frequently boys' menus were assessed as proper and satisfactory. The frequency of occurring of good and satisfactory menus predominated among girls (good: girls 40,5% boys 33,1%; inappropriate 19,0% and 11,5% respectively), whereas menus requiring improvement predominated among boys (55,4%, girls 40,5%). The difference resulted from the basic classification's assumptions concerning products assigned to the “products of animal origin” group. In Szczygłowa's method products

such as meat, poultry, fish, egg were considered as products of animal origin, while according to Bielińska's method also milk and its products were in this group. The percentage of girls' good menus was 7% higher than the boys', but unfortunately, inappropriate menus were two times more often among girls than boys. In turn, statistically significant differences were recognized in quality analysis of menus between elementary schools placed in Bydgoszcz. Against a backdrop of analyzed educational institutions the ES C was ranked the highest (assessment according to Szczygłowa) together with ES D (assessment according to Bielińska). The lowest rank, however, in case of both types of analysis, had the ES E. The analysis of individual elements of diet according to Bielińska, has depicted that in children's menus, wholemeal bread, groats and pulses could rarely be found in at least one meal (20,3% of menus in total). The small percentage of menus (42,6% overall) contained vegetables and/or fruit in at least 3 meals and also products of animal origin, including milk/milk products (32% of menus in total). At two schools this criterion was fulfilled in every second menu (about 54%). In the rest of schools, the above-mentioned criterion was even less favorable, about 53% at school D, 36% at school E, 26% at school A and 22% at school B. The favorable percentage of menus involving vegetables and fruit at schools C and D could have been a result of long-standing commitment of pedagogical staff, school nurse and institution's authorities when it comes to promoting proper eating habits among students and their parents.

Discussion:

The assessment of nutritional value of children' and youth' menus in Poland indicated many inaccuracies for many years, denoting the lack of correct balance. Insufficient amount of calcium, zinc, potassium and vitamin C and D and vitamins from B group has been noticed. The quality assessment has shown the unsatisfactory nutrition of cereal products, especially wholemeal, pulses, milk, milk products and fish. The irregularity of eaten meals, frequent eating up of food containing small amount of nutritional value, are the most usual eating mistakes, which have appeared among students from elementary schools (Zimna-Walendzik [7], Szaflarska-Szczepanik et al. [8]). Roszko-Kirpsza et al. [9] have depicted that irregularity of eating meals is two times more frequent among children living in a village than children living in a city.

Research of many authors (Cisek et al. [10], Pysz M. et al. [11], Sothern M [12], Wójt-Kempa M, Lewandowska O. [13]) has revealed the necessity of checking environmental conditions and subsidies for schools while carrying out the research of children' nutrition. On

the basis of the performed quality analysis of two schools as a part of this dissertation, active promotion of health and healthy lifestyle bring positive effects over time and the quality assessment of nutrition at those institutions was more favorable than at others. Schools can apply for subsidies from City Hall (Portal of Bydgoszcz city [14]) and take part in many health-oriented programs, supporting the struggle with overweight and obesity among school children and youth (Agricultural Market Agency [15]). One of the program which had been implemented in Poland was the “Glass of milk” program. Through the distribution of milk and milk drinks at schools, one of the two minimal milk portions is provided for children. A milk is a good source of calcium, essential for bone structure and the element participating in many enzymatic reactions (Gawęcki, Hryniewiecki [16]).

Despite the fact that elementary and lower-secondary schools have the opportunity to be a participant in governmental program called “Vegetables and fruit at school” (Agricultural Market Agency [15]), the low level of eating them can be still observed. The study has shown that vegetables and fruit in 3 meals are present in 23-54% on children' menus from elementary schools in Bydgoszcz. Higher percentage of menus turned out to be at schools which have been taking part in the program “Vegetables and fruit at school” for many years. It could be expected that the presence of vegetables and fruit in 3 meals in menus of elementary school children in Bydgoszcz is more visible since the study was carried out at the turn of May and June 2012. Spring and summer seasons favor increasing the number of raw vegetable material at groceries, at a lower price. Stankiewicz et al. [17] have illustrated that up to 86% of population of 6-7 years old children from Gdańsk, have eaten vegetable once a day or 3-4 times a week. Whereas fruit were eaten by 30% of population. Researchers justify children' stronger preference towards fruit than vegetable, that there is wider range of fruit available and the possibility to eat them without the heat treatment. Fruit and juices are easily accepted by children due to their sweet taste. Some vegetable, for instance pepper, onion, cauliflower, broccoli and radish and negatively rated by small children due to their taste and smell. High percentage of children and teenagers (up to 90.7%) eating fruit every day have been recognized in study of Roszko-Kirpszy et al. [10] Raw vegetables served for dinner every day have been eaten by 78,0% of analyzed children, and boiled vegetables were eaten by 79.4% of children. Among children living in Bydgoszcz, it has been stated that raw fruit and vegetables were present every day in at least one meal of 78% of girls and 82% of boys.

Conclusions:

1. Quality assessment of menus of 1st grade in elementary school children in Bydgoszcz has shown some inaccuracies in their content.

2. Differences between the quality of boys' and girls' diets and between analyzed schools have been recognized.
3. Recognized inaccuracies in menus' content signalize the risk of mineral and vitamins deficiency among children' nutrition.

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