Suliga Edyta, Cieśla Elżbieta, Zemlik Joanna, Pietraszkiewicz Magdalena Joanna. Evaluation of nutrition in children of preschool age. Journal of Education, Health and Sport. 2017;7(10):52-58. eISSN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.1000963
http://ojs.ukw.edu.pl/index.php/johs/article/view/4956

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26.01.2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 15.09.2017. Revised: 10.10.2017. Accepted: 10.10.2017.

EVALUATION OF NUTRITION IN CHILDREN OF PRESCHOOL AGE

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Abstract

Introduction. Overweight and obesity resulting in preschool are difficult to reverse, and are associated with many serious health complications and increased risk of premature

illness and death in adulthood. Few of the existing publication evaluates daily food rations preschool children.

Aim of the study. Evaluation of nutrition of children of preschool age in terms of demand for energy and macronutrient intake in children of normal BMI and overweight children and obesity.

Material and methods. The analysis included 102 children. Nutritional status was assessed on the basis of anthropometric characteristics and indicators in relation to the WHO centile charts. Feeding analyzed on the basis of average daily intake, calculated as the mean of the 3-day storage menus. Estimation of the nutrient content in the children's diet was carried out using diet 5. The analysis used statistical package STATISTICA 12.0.

Results. BMI correct in 83% of subjects, and 16% of excess body weight were observed. With regard to the energy and nutritional average daily food rations showed no statistically significant differences between the group of children with normal BMI and a group of children with overweight and obesity. The supply of energy and macronutrients in average daily diet of children deviated from the recommended standards among both groups of children studied.

Conclusions. The results showed a number of deficiencies in the nutrition of preschool children. Intake of nutrients in daily food rations differ from dietary recommendations for this age group. It is necessary to educate parents on the proper nutrition of children.

Keywords: preschool children, nutrition assessment, normal BMI, overweight.

Introduction

The main factor ensuring the proper development of the child is its rational nutrition. Preschool children are in need of a variety of foods rich in nutrients for growth and development, as they are very susceptible to deficiency or excess of certain food ingredients [1]. The quality of the diet is an important factor contributing to optimal health and prevent chronic diseases. Improper dietary patterns that cause the development of chronic diseases, seem to have started early in life and often are fixed in adulthood [2]. In recent decades it has increased the number of overweight and obesity among children. Recent evidence suggests that overweight and obesity resulting in preschool are difficult to reverse, and are associated with many serious health complications and increased risk of premature illness and death in adulthood [3, 4]. So far, published studies are focused on the assessment of nutrition in kindergartens or catering facilities, while relatively little is estimated daily food rations. The aim of the study was to evaluate the diet of preschool children (4 years), in terms of energy

demand and consumption of macronutrients in relation to current standards among children of normal weight and overweight children and obesity.

Material and methods

The study was conducted at the turn of 2015 and 2016. 4 in public kindergartens from Kielce. Total dietary interviews were obtained for 120 children, but the analysis covered 102 of them (56 boys and 46 girls), 18 people were excluded due to lack of complete data. Nutritional status of children rated based on features (weight and body height) and anthropometric indicators (BMI) for centile charts (WHO normal weight - 5 to 85 percentile, overweight - from 85 to 95 percentile, obesity - over 95 percentile). Diet was analyzed on the basis of average daily consumption, calculated as the average of the 3-day record of menus for each child. The serving size was determined measures of households (e.g.,. Glass of 250 ml, 10 ml tablespoon teaspoon mL) and commercial (e.g.. 150 g cheese packaging, juice carton 200 ml). Estimation of the nutrient content in the children's diet was carried out using diet 5. Diet nutrient content compared to normal average demand EAR (Estimated Average Requirement) in this age group [5]. In the description of the supply of individual nutrient were used and the average standard deviation, and median and quartiles 1 and 3 of decomposition, due to the oblique feeding schedules analyzed variables. To determine the significance of differences in the diets of children between normal children and BMI of overweight and obese non-parametric test was applied Mann-Whitney U. For the analysis was used statistical package STATISTICA 12.0. The level of significance of $p < 0.05$.

Results

Among the children studied normal BMI had 83%, while 16% been shown to induce a proportion by weight of the growth-manifesting excess body weight. Table 1 presents the results of the average daily supply of energy and essential nutrients for all children studied. With regard to the energy and nutritional average daily food rations of children showed no statistically significant differences between the group of children with normal BMI and a group of children with overweight and obesity (Table2.). Table 3 shows the percentage of individual nutrients in the daily menus including standards for energy-diet in 1400 kcal (EER standard for children aged 4-6 years).

The supply of energy and macronutrients in average daily diet of children deviated from the recommended standards among children of normal weight, and among children with higher BMI. In both groups, an excess of protein and carbohydrates, in particular sucrose, and digestible carbohydrates and insufficient intake of fat, fiber and n-3 fatty acids.

Table 1. The average daily intake of energy and essential nutrients for all children studied in relation to standards

	total children			Standard [5]
	X (SD)	ME	(Q1-Q3)	
Energy [kcal]	1308.1 (227.14)	1279.7	(1162,04-1441,29)	1400 kcal
Total protein [g]	50.8 (11.45)	49.83	(42,80-56,10)	16 g
Animal protein [g]	35.1 (11.21)	34,31	(27,48-40,55)	
Vegetable protein [g]	14.52 (3.77)	14,15	(12,42-16,00)	
Total fat [g]	43.93 (11.25)	43.32	(36,43-50,80)	47-54 g
saturated fatty acids [g]	18.02 (4.84)	17.99	(14,38-21,20)	
Monounsaturated fatty acids [g]	16.6 (5.34)	15,92	(12,97-19,50)	
Polyunsaturated fatty acids [g]	5.23 (2.12)	4.78	(3,98-6,32)	
Cholesterol [mg]	195.92 (77.78)	186.76	(139,85-233,64)	300 mg
Carbohydrates total [g]	187.93 (35.81)	186.95	(163,09-209,91)	130 g
Available carbohydrates [g]	175.86 (33.77)	176,65	(150,24-195,86)	30 - 70 g
Starch [g]	73.3 (20.10)	71.56	(60,35-84,80)	
Sucrose [g]	54.55 (16.66)	52.31	(44,28-64,91)	
Lactose [g]	13.64 (8.2)	13.48	(7,56-16,47)	
Dietary fiber [g]	12.2 (3.13)	11.9	(10,00-13,94)	14 g

wherein X - average SD - standard deviation, Me - median, Q1 - Q3 first quartile - the third quartile

Tabela.2 The Average daily intake of energy and essential nutrients for children with normal BMI

	Children with normal BMI			**Children with excess body weight**			**FROM**	**p**
	X (SD)	ME	(Q1-Q3)	X (SD)	ME	(Q1-Q3)		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Energy [kcal]	1309.1 (223.83)	1,282.53	(1162.04 - 434.88)	1302.94 (250.28)	1,263.52	(1203.2 - 1531.07)	0.10775	0.914194
Total protein [g]	50.52 (11.17)	49,68	(44,32-55,27)	52.20 (13.02)	50.36	(40,42-60,14)	-0.40406	0.686166
Animal protein [g]	34.83 (10.86)	34.15	(29,26-40,55)	36.44 (13.10)	35.01	(25,35-39,05)	-0.22448	0.822384
Vegetable protein [g]	14.58 (3.83)	14.10	(12,42-16,00)	14.21 (3.59)	14.23	(12,43-15,98)	0.16163	0.871601
Total fat [g]	43.46 (11.45)	43.37	(36,27-50,57)	46.24 (10.23)	42,56	(37,82-54,51)	-0.90690	0.364460
saturated fatty acids [g]	17.98 (5.05)	17.90	(14,33-20,96)	18.21 (3.73)	18.32	(15,66-21,63)	-0.29631	0.766991
Monounsaturated fatty acids [g]	16.40 (5.39)	15.67	(12,95-18,62)	17.62 (5.08)	16.87	(13,79-21,41)	-0.85302	0.393646
Polyunsaturated fatty acids [g]	5.18 (2.09)	4.74	(3,98-6,32)	5.48 (2.31)	5.22	(4,16-6,13)	-0.61957	0.535544

1	2	3	4	5	6	7	8	9
Cholesterol [mg]	191.06 (74.08)	183.88	(139,01-227,14)	220.21 (92.88)	196.35	(157,74-258,49)	-1.01465	0.310273
Carbohydrates total [g]	189.71 (33.67)	187.53	(163,59-211,40)	179.07 (45.20)	180.02	(142,90-206,94)	1.10444	0.269402
Available carbohydrates [g]	177.40 (31.61)	177.62	(153,28-195,86)	168.14 (43.29)	169.59	(132,88-193,28)	0.89792	0.369228
Starch [g]	72.86 (19.43)	70,82	(60,35-84,80)	75.66 (23.72)	72.29	(67,52-83,41)	-0.35917	0.719469
Sucrose [g]	56.07 (16.49)	54.33	(45,6-65,57)	46.97 (15.83)	50,30	(38,73-54,82)	1.76890	0.076911
Lactose [g]	13.49 (7.19)	13.71	(7,91-15,94)	14.39 (12.35)	9.32	(5,46-16,49)	0.87996	0.378880
Dietary fiber [g]	12.42 (3.14)	11.96	(10,01-13,97)	11.08 (2.90)	11.17	(9,03-13,80)	1.30199	0.192922

wherein X - average SD - standard deviation, Me - median, Q1 - Q3 first quartile - the third quartile, Z - normally distributed p - level of significance

Table 3. Percentage of primary energy from nutrients

The share of energy [%] from	**total children**			**Standard [5]**
	X (SD)	ME	(Q1-Q3)	
protein	15.70 (2.45)	15.54	(43,11-55,99)	10-15%
fats	29.64 (4.90)	29.5	(43,11-55,99)	30-35%
carbohydrates	54.66 (5.68)	54.05	(43,11-55,99)	50-70%

wherein X - average SD - standard deviation, Me - median, Q1 - Q3 first quartile - the third quartile,

Discussion

Similar to our study, the percentage of children with excessive body weight was observed by other authors [6]. Harton et al. [7] indicate that the problem of overweight and obesity are increasing and that abnormal BMI is observed in every fourth child in preschool. In the study, no statistically significant differences in the intake of nutrients depending on the BMI of the children, which corresponds to the results obtained by Wang et al. [8]. The survey also revealed a number of irregularities in the diet of children in the very high protein intake as well as excessive intake of carbohydrates, primarily from sweets and sweetened drinks, consumed by most children [9, 10]. A significant part of the children did not consumed the recommended portion of vegetables and fruits. Similar conclusions were reached by other researchers [6, 7, 11, 12]. A frequent mistake occurred in the study population was the excessive number of improperly balanced meals and snacking between meals, as demonstrated by Gacek [12] and Szczepańska et al. [13].

Conclusions

The results showed a number of deficiencies in the nutrition of preschool children. Intake of nutrients in daily food rations differ from dietary recommendations for this age group. It is necessary to educate parents on the proper nutrition of children.

Acknowledgement

The study was financed entirely from the subsidy of the Ministry of Science and Higher Education to finance the basic statutory activity of the Faculty of Medicine and Health Sciences JKU in Kielce No. 615507 and 615540.

Authors' contributions

ES designed the study, participated in the statistical analysis and reviewed the manuscript. EC participated in the statistical analysis and reviewed the manuscript. JZ participated in the study design and collected data from studied group. MJP analyzed and interpreted the nutrition data and wrote the manuscript. All authors read and approved the final manuscript.

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