

# Analysis of nutrition of children in Warsaw day nurseries in view of current recommendations

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**Abstract:** The aim of the study was to analyse the nutrition of children aged 13-36 months in selected day nurseries in the city of Warsaw, conducted in 20 selected day nurseries which were responsible for providing care for a total of 1,692 children. The diet of children in the day nurseries was evaluated on the basis of a questionnaire distributed between 2008-2009 among the staff responsible for organizing meals at selected establishments belonging to the nursery unit of Warsaw (n=20, 1-5 centrally located branches), while the nutritional value of average food rations was calculated on the basis of 10-day inventory reports. Children attending the day nurseries were fed in accordance with the existing nutritional recommendations. Average food rations provided were similar to the recommended food intake for children aged 1-3 years, with the exception of the excessive amount of cereal products, sugar and sweets. The energy and nutritional value of an average food ration with regard to macroelements was compliant with the dietary standards for a day in previous years, and significantly higher than the standards of 2008, in particular with respect to proteins and vitamins from the B group. Vitamin D deficiency was observed in the children's diets. There is a need to implement at day nurseries the current recommendations on nutrition of children aged 13-36 months to prevent obesity and iron deficiency [1-4].

**Key words:** mass catering, children aged 1-3 years

## INTRODUCTION

In 2009, there were 356 public day nurseries in Poland, of which 56 were located in the Mazowieckie Voivodeship. Day nurseries in this region provide care for over 8,000 children a year. The majority of children spend 75% of the time during the day in such nurseries and eat several meals there, thus a great responsibility lies with the nutritional departments in the analysed nurseries. It should be emphasized that children are a group vulnerable to the consequences of inappropriate nutrition [1, 2, 4-9]. Therefore, nutritional recommendations and healthy eating principles are a matter of utmost importance.

The objective of the study was to analyse the nutrition of children aged 13-36 months in selected day nurseries in the city of Warsaw.

## MATERIAL AND METHODS

The study of the nutrition of children in day nurseries was conducted in 2008 and 2009, using the questionnaires distributed among the personnel responsible for the organisation of nutrition in selected nurseries (n=20; 1-5 centrally located branches) from a group of day nurseries of the city of Warsaw. The study was performed using a questionnaire and decadal food inventory reports from each

child day care centre. Decadal inventory reports were used for calculating average food rations in the nurseries. The rations were compared with model daily food rations for children aged 1-3 years which should be achieved in 70% in these day nurseries [10]. The nutritional value of average daily food rations for children in day nurseries was calculated on the basis of decadal diets, using 'Dietetyk 2' software, and the nutritional value tables for selected food products and meals [11]. The obtained results were compared to nutritional standards from 2001 and 2008 [10, 12-14].

## RESULTS

Meals prepared in the participating day nurseries were served to 1,692 children aged 1-3 years. There were 164 infants (9.7%), 613 children in the second year of life (36.2%) and 915 (54%) children over 2 years old. Among them, 44 (3%) were breastfed and 308 (20%) of children were on elimination diet without milk and/or on a gluten-free diet.

The majority of children had 4 meals a day. In one nursery, children also received a supper. In each facility, children had breakfast, elevenses (second breakfast), lunch and an afternoon snack. Lunch consisting of a soup and a second course, served as one meal in 3 (15%) of day nurseries, while in the remaining 17 (85%) day nurseries children had soup and the second course separately at different times in the afternoon. The products most often served to children as a dessert or an afternoon snack included: starch jelly, blancmange, cottage cheese and yoghurt, as well as various types of cakes, mainly sponge cakes and cheese cakes. In 25% of the day nurseries, sandwiches or

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pancakes were prepared for the afternoon snack. Only in one nursery salt was not used as an additive to meals.

The meals prepared in the day nursery kitchens consisted of products from the list of foodstuffs allowed for use in the nutrition of the youngest children, drawn up by the Office for Day Nurseries in Warsaw, in cooperation with the Institute of Mother and Child. The analysed day nurseries also used ready-made products for infants and small children, most often follow-on infant formulae, fruit juices, milk and fruit cereal and fruit puree. Vegetable juices and infant milk were used in several facilities. The meals for children did not include meat products, nor vegetable and meat products from the group of foodstuffs for special nutritional purposes. In all analysed day nurseries, milk dishes for children were made with liquid milk with 2% and/or 3.2% fat content. In 10 day nurseries, water in unit packages, intended for infants and small children, was used for preparing beverages with fruit syrup. Three of the day nurseries used filtered water for cooking, while the other used mainly water from the water supply system.

Analysis of the distribution of energy value of average food ration between particular meals revealed insignificant differences with regard to recommendations (Figure 1) [10].

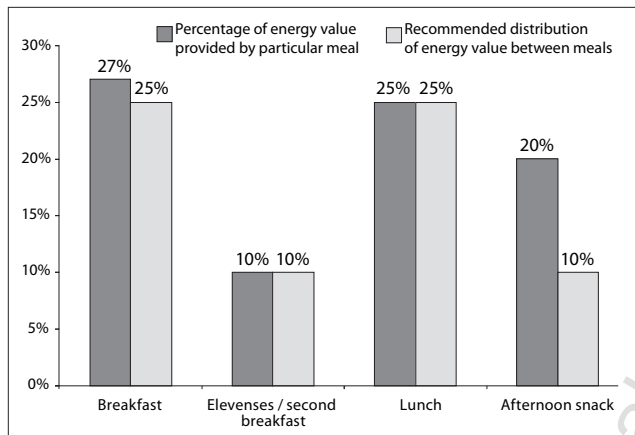


Figure 1 Distribution of energy value of average food ration between meals.

Analysis of the food product intake (average food ration established on the basis of decadal food inventory reports from each nursery) revealed deviations from the recommended food rations for children aged 1-3 years in some product groups (Figure 2) [10].

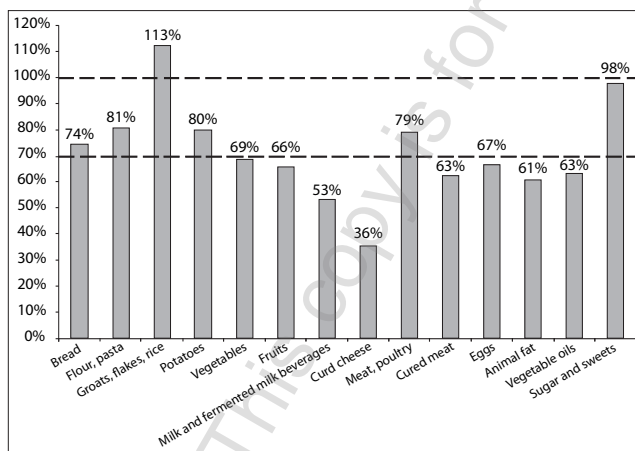


Figure 2 The realisation degree of recommended food rations of children attending day nurseries in Warsaw.

Table 1 presents average food rations of children attending day nurseries in Warsaw.

Table 1 Average food rations of children attending day nurseries in Warsaw.

Products	Unit	Average food rations	SD
1 Cereal products	G	210,8	33,2
Bread	G	52,1	14,5
flour and pasta	G	16,1	4,7
groats, flakes and rice	G	22,5	15,4
Potatoes	g	120,1	23,0
2 Vegetables and fruits	g	404,6	65,7
Vegetables	g	239,9	35,6
Vegetables	g	164,6	38,2
3 Milk and milk products	g	334,9	81,5
milk and fermented milk beverages	g	318,5	78,9
curd cheese	g	14,2	6,0
Cheese	g	2,3	1,9
4 Meat, cured meat, fish and eggs	g	66,5	8,3
meat, poultry	g	23,7	7,6
cured meat	g	12,5	4,5
Fish	g	5,3	2,9
Eggs	g	25,0	4,0
5 Fats	g	15,4	7,1
Animals fat	g	9,7	1,8
vegetable oils	g	5,7	6,2
6 Sugar and sweets	g	29,3	3,3

The share of *cereal products* in an average food ration of children was higher than recommended. Groats, flakes and rice were used in the average amount of  $22.5 \pm 5.4$  g, bread –  $52.1 \pm 14.5$  g, flour and pasta –  $16.1 \pm 4.7$  g per child per day. Children consumed on average  $120.1 \pm 23.0$  g of potatoes per day.

The consumption of *vegetables and fruit* was slightly lower than the standard. Children ate more vegetables than fruits, i.e.  $239.9 \pm 35.6$  g and  $164.6 \pm 38.2$  g, respectively.

The total share of *milk and milk products* in average food rations of children amounted to  $334.9 \pm 81.5$  ml per day. The intake of milk and fermented milk beverages was much lower than recommendations, as was the intake of curd cheese.

The share of products from the *group consisting of meat, cured meat, fish and eggs* on average totaled  $66.5 \pm 8.3$  g. Children ate approximately  $23.7 \pm 7.6$  g of meat, mainly poultry, in their meals. The analysis of the intake of cured meat showed that its share in an average food ration in day nurseries amounted to  $12.5 \pm 4.5$  g (one slice). The safe nutrition model for children recommends serving fish. In day nurseries in Warsaw, fish were served occasionally in small amounts ( $\bar{x} = 5.3 \pm 2.9$  g/day). The consumption of eggs stood at  $25.0 \pm 4.0$  g, which is tantamount to 0.5 egg per day.

The content of *fats* in the diets of children in day nurseries amounted to  $15.4 \pm 7.1$  g. Vegetable oils were added to salads and soups ( $\bar{x} = 5.7 \pm 6.2$  g/day). The average intake of animal fats, i.e. butter and cream, by children was  $15.4 \pm 1.8$  g. Butter was used for preparing meals in all the day nurseries. Rapeseed oil and olive oil were also used very often, in 90% and 95% of nurseries. Various types of margarines and sunflower oil were used in 50% of the day nurseries. Soybean oil was used for preparing meals in one in five day nurseries.

The share of the products from the *sugar and sweets group* in the average daily food rations of children was higher by

one third than the recommended share, and amounted to  $29.3 \pm 3.3$  g per day, on average.

Table 2 presents the nutritional value of average food rations of children attending day nurseries in Warsaw.

**Table 2** Nutritional value of average food rations of children attending day nurseries in Warsaw.

Nutrients	Unit	Mean	SD	Median	Lower quartile	Upper quartile
<b>MACRONUTRIENTS</b>						
Energy	kcal	964.8	97.4	972.3	929.0	1,022.2
Protein	g	33.6	4.4	33.9	31.0	36.3
Fats	g	33.2	5.3	33.0	30.2	36.7
Carbohydrates	g	142.4	18.5	143.6	131.6	153.2
<b>MINERALS</b>						
Calcium	mg	476.5	87.0	473.6	417.	535.2
Phosphorus	mg	616.0	84.9	622.0	564.3	666.9
Iron	mg	4.5	0.8	4.5	4.0	4.9
Magnesium	mg	136.1	28.6	133.6	117.1	152.7
Sodium	mg	581.6	140.6	571.3	487.1	663.1
Potassium	mg	1,731.3	295.5	1,749.7	1,561.2	1,906.6
Copper	mg	0.6	0.1	0.6	0.5	0.7
Zinc	mg	4.3	0.8	4.3	3.8	4.7
<b>VITAMINS</b>						
Vitamin A	µg	539.5	209.2	508.1	401.7	634.7
Vitamin D	µg	0.9	0.3	0.8	0.7	1.0
Vitamin E	mg	3.1	0.8	3.1	2.7	3.5
Vitamin B1	mg	0.5	0.1	0.5	0.4	0.5
Vitamin B2	mg	0.9	0.1	0.93	0.8	1.0
Vitamin B6	mg	1.0	0.2	1.0	0.9	1.1
Vitamin B12	mg	1.9	0.4	1.9	1.7	2.2
Folate	µg	78.8	15.6	77.4	68.9	87.8
Vitamin C	mg	30.6	13.0	27.9	22.5	27.9

*Energy value* of an average food ration of children in day nurseries amounted to  $964.8 \pm 97.4$  kcal, and was by around 20% higher than the current recommendations (2008) [12], but was compliant with the recommendations from previous years [10].

The average content of *proteins* consumed in a food ration for children in day nurseries was more than twice higher than the current standard and amounted to  $33.6 \pm 4.4$  g. The intake of proteins was more similar to the standards from 2001 [10].

The average content of *fat* in the children's diets totaled  $33.2 \pm 5.3$  g. The demand for fats was satisfied in 72% compared to the 2001 standards and in 85% compared to the 2008 standards [12].

Analysis of the intake of *carbohydrates* showed that the average content in the food ration in day nurseries stood at  $142.4 \pm 18.5$  g, i.e. significantly higher than the current recommendations. The range between the first and third quartile amounting to 131.6-153.1 g did not show significant discrepancies in total intake of carbohydrates. According to the norms published in 2008, the demand for carbohydrates in total was satisfied in 110% by the food ration in day nurseries. Comparison of average figures with recommendations from previous years shows that they covered the standards for children attending day nurseries in 78%.

Average content of *calcium* in the diets of children in day nurseries in Warsaw totaled  $476.5 \pm 87.0$  mg per day, i.e. 95% of the 2008 standard for day nurseries and 48% of the 2001 standard. The content of *phosphorus* in children's diets amounted to  $616.0 \pm 84.9$  mg/day. The intake of *magnesium* was almost twice as high as the current recommendations and

amounted to  $136.1 \pm 28.6$  mg per day. The analysed diets of children in day nurseries included a correct amount of *sodium* amounting to  $581.6 \pm 140.6$  mg per day. Compared to a considerably lower norm from 2001, this was twice as high. The average value of *potassium* in the diets of children attending day nurseries was estimated at  $1,731.3 \pm 295.5$  mg. The range between the first and third quartile amounted to 1,561.2-1,906.6 mg, which demonstrated the significant variety of potassium content in food rations of children in day nurseries. Compared to the norms from 2001 and 2008, the share of potassium is closer to the currently binding nutritional standards. The intake of *iron* by the children attending day nurseries was the lowest and amounted on average to  $4.5 \pm 0.8$  mg. This amounted to 64% of the current standards and to only 45% of the standards from previous years. Analysis of the *zinc* intake revealed that its average value was  $4.3 \pm 0.8$  mg, which covered the current recommendations by as much as 143%, and the standard from 2001 only in 43%. The *vitamin A* content in the diets of children attending day nurseries stood at  $539.5 \pm 209.2$  µg per day. Significant differences in the consumption of this vitamin were recorded. The range between the first and third quartile amounted to  $401.7 \pm 634.7$  µg per day. The intake of *vitamin D* in the analysed diets was at a very low level. The average vitamin D content stood at  $0.9 \pm 0.3$  µg per day (the 2001 standard – 15 µg compared to the 2008 standard – 5 µg / 10 µg – medical standard from 2009). The *vitamin E* content was also lower than the standard and stood at  $3.1 \pm 0.7$  mg per day (52% of recommended intake in day nurseries).

Analysis of water-soluble vitamins content in children's diets revealed that this was the highest in the case of *vitamin B<sub>12</sub>* – the average amount totaled  $1.9 \pm 0.4$  mg per day. The intake of *vitamin B<sub>6</sub>* was also significantly different from that recommended and stood at  $1.0 \pm 0.2$  mg per day, i.e. it was twice as high as the recommended intake from the food ration in day nurseries. The average vitamin B<sub>6</sub> content in the diets was closer to the requirements from previous years. The *riboflavin* content in the diets of was high and significantly exceeded the standard – the average value amounted to  $0.9 \pm 0.1$  mg per day. Analysis of the intake of *thiamine* in the diets of analysed children showed that its content was also higher than recommended and totaled  $0.5 \pm 0.1$  mg per day. The content of *folates* in the diets of children attending day nurseries in Warsaw was insufficient and amounted to  $78.8 \pm 15.6$  µg, covering the current recommendations only in 53%. Such results stem from considerably lowered current standards for vitamins from the B group. The intake of *vitamin C* at  $30.6 \pm 13.0$  mg was similar to the requirements.

In 85% of studied nurseries, the diets were composed by the employees responsible for food supply. Only in 3 day nurseries, dieticians were responsible for preparing meals. Nurses were also involved in composing the diets.

## DISCUSSION

Assessment of diets of children aged 1-3 years who attended day nurseries in Warsaw showed that the food rations of the children were dominated by cereal products and potatoes, meat and poultry, as well as sugar and sweets. The amount of milk and milk products served in average food rations of children in day nurseries was insufficient when compared to recommendations. Low milk consumption by children has also

been observed in other European countries [15, 16]. The intake of fruit and vegetables, which are a source of carbohydrates, dietary fibre, vitamins and minerals, was similar to the current recommendations. The study of the food intake in a group of younger children (0-2 years old) conducted by Fox, obtained different results. The main source of energy in the diets of infants and toddlers included infant formula, breastmilk and milk [17]. Evaluating the diets of children in the postinfancy period, Weker et al. reported that 77% of children ate meat every day, and the energy value of the daily food ration was within the limits set by the recommendations on nutrition [18]. Those results corresponded to the results obtained in this study.

The study conducted by Huybrechts et al., the objective of which was to compare food group intakes with the guidelines, showed similar trends to the results obtained in this study. They showed that the intakes of vegetables, fruit and milk among children in postinfancy period were below, but the intakes of cereal products, potatoes and meat products were in line with the recommendations [16]. Lorson et al. obtained other results. Following the analysis of 24-hour diets, they showed that the intake of fruit and juices was significantly higher among children aged 2-5 years, compared to the 6-11 years or 12-18 years age groups. The diets of older children were dominated by vegetables and potato chips [19]. Other studies have indicated that nutrition in nursery and education facilities may be more advantageous than at home, especially with regards to proportion and quality of nutrients (excepting fats, carbohydrates) [20]. Alternatively, nutrition of children in nurseries and education facilities can also give cause for concern because of the tendency of an increased supply of fat, its increased share in the diet's total pool of a energy, an excess of saturated fatty acids, fibre and certain vitamins [21].

Summing up the nutrition of children in nursery schools, it was concluded that the diets were in line with the safe nutrition model for younger children. Children received 4 meals and day nurseries used natural foods, only slightly processed [2, 7]. Children attending day nurseries were fed in accordance with the nutritional recommendations from 2001.

The nutrition of children in nurseries is not always deemed correct. A well-planned US study showed that although nurseries should be guided by specific regulations and standards regarding to children's nutrition, in practice they were observed in varying degrees, in different regions, thus affecting the nutritional status of the children [22, 23].

The conducted analyses allow the conclusion that:

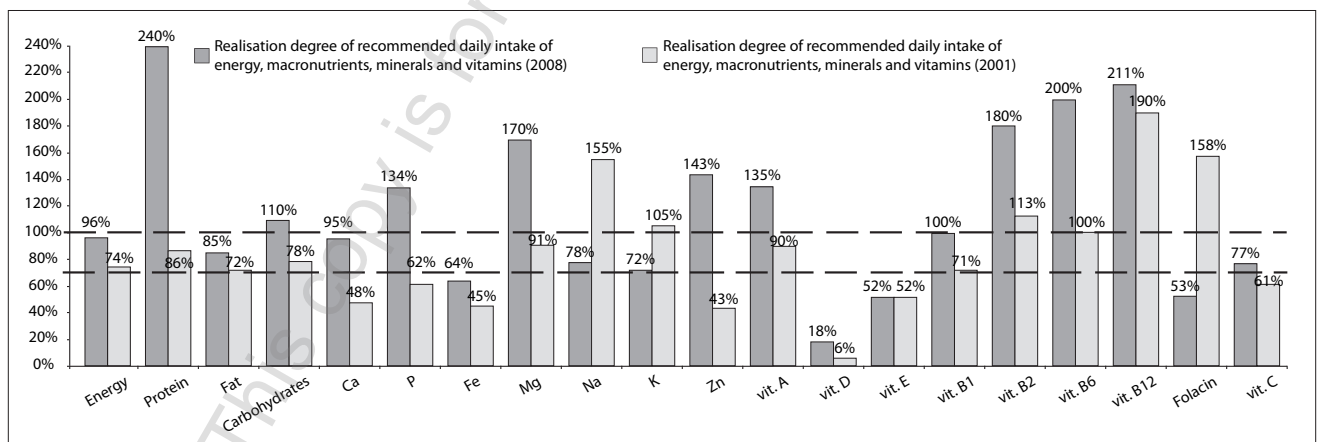
- average food rations provided in day nurseries were in accordance with the recommended food intake for children aged 1-3 years, except for an excessive amount of cereal products, sugar and sweets;
- energy and nutritional value of average food rations of children in day nurseries with regard to macroelements was in line with dietary standards adopted in previous years, and significantly higher than the 2008 standards (Figure 3).

## CONCLUSIONS

1. Children attending day nurseries in Warsaw are fed in accordance with previously binding nutritional recommendations (2001).
2. There is a need to implement in day nurseries the current recommendations on nutrition of children aged 13-36 months to prevent obesity and iron deficiency.

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**Figure 3** Realisation degree of recommended daily intake of energy, macronutrients, minerals and vitamins in food rations of children attending day nurseries in Warsaw.

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