

## DIETARY HABITS OF EARLY SCHOOL-AGED CHILDREN AND NUTRITIONAL KNOWLEDGE OF THEIR PARENTS

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### ABSTRACT

**Background.** The early school period is essential in shaping dietary habits. This process is largely dependent on the nutritional knowledge of parents and caregivers.

**Objective.** To assess the impact of parents' nutritional knowledge on the frequency of consumption of selected groups of food products by their children at early-school aged.

**Material and Methods.** The survey, in the form of an online survey, was conducted among parents of children from grades 1-3. The study included 179 children aged 6-11 years (mean 8.1), 54.5% of whom were girls. Questions about children's eating habits included the frequency of consumption of specific product groups (fruits, vegetables, dairy products, whole grain cereal products, fish, meat, cold cuts, legumes, nuts and seeds, eggs, sweets). Nutritional knowledge was determined on the basis of parents' self-assessment. Statistical analysis included a heat map and Pearson correlation.

**Results.** A high level of nutritional knowledge of parents was associated with a high correlation in the consumption of fruits and vegetables (0.64), and in the case of vegetable consumption with a high correlation with the consumption of whole grains and legumes. Negative correlations were found between meat consumption and consumption of vegetables, whole grains and legumes. In the nutrition model of children of people declaring a lack of nutritional knowledge, a strong positive correlation was also found between the consumption of fruit and vegetables (0.72), vegetables and meat (0.75), as well as nuts and milk (0.75). The consumption of sweets was strongly correlated with the consumption of fish, legumes and cold cuts, and negatively correlated with the consumption of whole grains, meat and nuts. The heat map shows a clearly higher consumption of sweets and cold cuts among children of people declaring a lack of nutritional knowledge.

**Conclusions.** Research confirms that parents' high nutritional knowledge is associated healthier food choices for their children.

**Keywords:** *dietary habits, children, nutritional knowledge, parents, heat map*

### INTRODUCTION

Developing proper eating habits in early childhood can be key to maintaining good health in adulthood. Children learn most effectively by observing their parents' dietary habits, especially when it is accompanied by emotions [1]. That is why parents' health-promoting dietary choices are so important. Achieving good results is associated with long-term nutritional education, not only of the family, but also of mass catering entities, such as kindergartens and schools, where children spend a large part of the day [2, 3]. In recent years, there has been a growing trend of implementing school projects that promote a healthy lifestyle, including those that shape proper eating habits or physical activity [4].

The basis for the correct composition of the children's diet, illustrated in the Pyramid of healthy nutrition and lifestyle for children and adolescents, should be

colorful vegetables and fruits. The pyramid, along with the accompanying rules, emphasizes the important role of fish, legumes, and nuts. Simultaneously, attention is drawn to the need to eliminate added sugar, which contributes to the development of dental caries and obesity [5]. In 2015, as many as 76% of children aged 12 in Poland were diagnosed with tooth decay, and this percentage increased with age [6]. This problem also affects other countries, where 60-90% of school-age children suffer from dental caries [7]. According to WHO recommendations, sugar consumption should not exceed 10% of energy. However, it seems that in order to prevent caries, sugar consumption should not exceed 2-3% of energy [8].

An improperly balanced diet is also one of the main risk factors for the development of obesity. Excess body weight is currently one of the major public health problems worldwide [9]. The problem of obesity and overweight affects about 30% of children

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aged 7-9 in Poland and the trend is growing [10]. Over the last 30 years, the percentage of children affected by this problem has increased by about 5 percentage points [11]. Unfortunately, the prevalence of excess body weight among preschoolers and children starting school in Poland is higher than the European average [12]. Besides lifestyle, including diet, there are many other risk factors for obesity. Breastfeeding, especially the period of exclusive breastfeeding, the parents' body weight, the health status of family members and the child's birth weight are negatively correlated with excess body weight [4].

Treatment of childhood obesity should be based on dietary modification, increased physical activity and psychological support. However, any interventions aimed at lifestyle changes should involve the whole family to be effective. Therefore, educating parents in this area is crucial [12].

Parents' lifestyle, including eating behaviors and nutritional knowledge, are correlated with the quality of their children's diet. People with higher knowledge tend to make healthier food choices, but they are also more aware of the impact of diet on the long-term health of children [13, 14]. According to a nationwide study of eating habits, over 80% of parents of children aged 3-9 claim to have a high level of nutritional knowledge and that their children have good or very good diet [15]. Unfortunately, research shows that practical nutritional knowledge is still insufficient [16]. Moreover, the main source of nutritional knowledge for Polish parents is the Internet or family, and much less often specialists such as dietitians, doctors or nurses [17].

Therefore, the aim of this study was to estimate the frequency of consumption of specific product groups and to assess the nutritional knowledge of parents based on self-assessment. In addition, the aim was to investigate the correlation between parents' knowledge and the consumption of the above-mentioned products by their children.

## MATERIAL AND METHODS

The study was conducted in 2024 among parents or legal guardians of children in grades 1-3 of primary school. The online survey was prepared using Google Forms software and then shared on social media. Before completing the questionnaire, each respondent read the cover letter explaining the purpose of the study and assuring the anonymity and voluntary participation. Questions about children's eating habits included the frequency of habitual intake of specific product groups: fruits (fresh, frozen), vegetables (fresh, frozen, except potatoes), dairy products, whole grain cereal products (bread, groats, rice and pasta), fish (including seafood), meat (excluding cold cuts), cold

cuts (including sausages), legumes, nuts and seeds, eggs, sweets (including dairy products sweetened with sugar). The question was "how often one serving of the product is consumed". The responses were as follows: "several times a day", "once a day", "several times a week", "several times a month", "less than once a month", "does not consume" for all questions except "fish", for this group the answers were: "more than 2 times a week", "1-2 times a week", "less than 1 time a week", "does not consume". Parents' nutritional knowledge was determined based on their self-assessment, i.e. the answers to the question "How do you assess your knowledge on child nutrition guidelines?". Before distributing the survey, the pilot study was conducted among 5 people.

Statistical analysis, divided by gender, was performed using the Pearson *chi*-square test (for qualitative variables) and the Mann-Whitney U test (for quantitative variables), with a significance level of  $p \leq 0.05$ . For qualitative characteristics, the number of persons and percentage are given, while for quantitative variables the mean, standard deviation (SD) and range (minimum – maximum) were provided. The normality of the distribution was tested using the Shapiro-Wilk test. Data were analyzed using the Statistica software version 13.3PL.

In order to observe the relationship between the declared nutritional knowledge of parents or caregivers and the tendencies in the consumption of given groups of food products, the Tau Kendall correlation analysis was used. In addition, a scaled heat map created with the R studio program was used to show hidden relationships between the frequency of consumption of the analyzed food groups and the declared nutritional knowledge of parents and/or caregivers.

## RESULTS

The study was conducted among 178 children aged 6-11 (average 8.1, SD 1.1), of whom 55% were girls. Girls were characterized by a slightly lower BMI (16.9 kg/m<sup>2</sup> vs. 17.9 kg/m<sup>2</sup>;  $p = 0.058$ ) and a significantly better financial situation of the family (for "good status", respectively 74.2% vs. 53.1%;  $p = 0.009$ ), than boys. More than 70% of parents rated their child's physical activity as at least high. About 16% of children had a food intolerance or allergy (Table 1).

Table 2 presents the characteristics of the intake of the analyzed food groups by children and the self-assessment of nutritional knowledge of parents. Girls, compared to boys, statistically significantly more often intake fruits (minimum one a day 83.5% girls vs. 59.2% boys;  $p = 0.007$ ) and vegetables (minimum one a day 74.3% girls vs. 55.6% boys;  $p = 0.034$ ), while boys – meat (minimum one a day 49.4% boys vs. 23.7% girls;  $p = 0.005$ ) and sweets (minimum one a day 39.3% boys

Table 1. General characteristics of the studied children

Factor	Total N = 178 (100%)	Girls N = 97 (54.5%)	Boys N = 81 (45.5%)	p
Child's age [years]				
Average (SD)	8.1 (1.1)	8.2 (1.1)	8.0 (1.1)	0.257 <sup>1</sup>
Range	6-11	6-11	6-10	
Residential area				
Village	62 (34.9)	36 (37.1)	26 (32.9)	0.423 <sup>2</sup>
City ≤ 100,000 inh.	59 (33.1)	34 (35.1)	25 (30.1)	
City > 100,000 inh.	57 (32.0)	27 (27.8)	30 (37.0)	
Self-rated economic status of family				
Good	115 (64.6)	72 (74.2)	43 (53.1)	0.009 <sup>2</sup>
Average	62 (34.8)	25 (25.8)	37 (45.7)	
Poor	1 (0.6)	0	1 (1.2)	
Child BMI [kg/m <sup>2</sup> ]				
Average (SD)	17.3 (2.8)	16.9 (2.5)	17.9 (3.1)	0.058 <sup>1</sup>
Range	12.2-24.5	12.2-24.4	13.1-24.5	
Child's physical activity				
Very high	45 (25.3)	20 (20.6)	25 (30.9)	0.256 <sup>2</sup>
High	81 (45.5)	45 (46.4)	36 (44.4)	
Average	45 (25.3)	29 (29.9)	16 (19.8)	
Low	7 (3.9)	3 (3.1)	4 (4.9)	
Food allergy/intolerance				
No	149 (83.7)	81 (83.5)	68 (83.9)	0.936 <sup>2</sup>
Yes	26 (16.3)	16 (16.5)	13 (16.1)	

<sup>1</sup> – Mann-Whitney U test; <sup>2</sup> – Pearson's *chi*-squared test,  $p \leq 0.05$

Table 2. Intake of food groups by children and nutritional knowledge of parents

Factor	Total N = 178 (100%)	Girls N = 97 (54.5%)	Boys N = 81 (45.5%)	p <sup>1</sup>
Fruits				
Several times a day	60 (33.7)	39 (40.2)	21 (25.9)	0.007
Once a day	69 (38.8)	42 (43.3)	27 (33.3)	
Several times a week	38 (21.4)	14 (14.4)	24 (29.6)	
Several times a month	5 (2.8)	1 (1.0)	4 (4.9)	
Less than once a month	2 (1.1)	1 (1.0)	1 (1.2)	
Does not consume	4 (2.2)	0	4 (4.9)	
Vegetables				
Several times a day	70 (39.3)	47 (48.5)	23 (28.4)	0.034
Once a day	47 (26.4)	25 (25.8)	22 (27.2)	
Several times a week	38 (21.3)	16 (16.5)	22 (27.2)	
Several times a month	16 (9.0)	8 (8.2)	8 (9.9)	
Less than once a month	4 (2.3)	1 (1.0)	3 (3.7)	
Does not consume	3 (1.7)	0	3 (3.7)	
Dairy products				
Several times a day	61 (34.3)	28 (28.8)	33 (40.7)	0.175
Once a day	74 (41.6)	47 (48.5)	27 (33.3)	
Several times a week	35 (19.6)	17 (17.5)	18 (22.2)	
Several times a month	2 (1.1)	2 (2.1)	0	
Less than once a month	1 (0.6)	1 (1.0)	0	
Does not consume	5 (2.8)	2 (2.1)	3 (3.7)	
Whole grain cereal products				
Several times a day	35 (19.7)	25 (25.8)	10 (12.4)	0.207
Once a day	31 (17.4)	18 (18.6)	13 (16.1)	
Several times a week	58 (32.6)	26 (26.8)	32 (39.5)	
Several times a month	33 (18.5)	18 (18.6)	15 (18.5)	
Less than once a month	12 (6.7)	5 (5.1)	7 (8.6)	
Does not consume	9 (5.1)	5 (5.1)	4 (4.9)	

Factor	Total N = 178 (100%)	Girls N = 97 (54.5%)	Boys N = 81 (45.5%)	p <sup>1</sup>
Fish				
More than 2 times a week	7 (3.9)	4 (4.1)	3 (3.7)	0.958
1-2 times a week	48 (27.0)	27 (27.9)	21 (25.9)	
Less than 1 time a week	95 (53.4)	52 (53.6)	43 (53.1)	
Does not consume	28 (15.7)	14 (14.4)	14 (17.3)	
Legume seeds				
Several times a day	2 (1.1)	1 (1.0)	1 (1.2)	0.302
Once a day	1 (0.6)	1 (1.0)	0	
Several times a week	37 (20.8)	25 (25.8)	12 (14.8)	
Several times a month	56 (31.5)	33 (34.0)	23 (28.4)	
Less than once a month	11 (6.2)	14 (14.5)	15 (18.5)	
Does not consume	53 (29.8)	23 (23.7)	30 (37.1)	
Eggs				
Several times a day	7 (3.9)	2 (2.1)	5 (6.2)	0.262
Once a day	17 (9.6)	10 (10.2)	7 (8.6)	
Several times a week	106 (59.6)	61 (62.9)	45 (55.6)	
Several times a month	39 (21.9)	22 (22.7)	17 (21.0)	
Less than once a month	1 (0.6)	0	1 (1.2)	
Does not consume	8 (4.4)	2 (2.1)	6 (7.4)	
Meat				
Several times a day	16 (8.9)	4 (4.1)	12 (14.8)	0.005
Once a day	47 (26.4)	19 (19.6)	28 (34.6)	
Several times a week	101 (56.7)	64 (66.0)	37 (45.7)	
Several times a month	12 (6.7)	8 (8.2)	4 (4.9)	
Less than once a month	0	0	0	
Does not consume	2 (1.1)	2 (2.1)	0	
Cold cuts				
Several times a day	20 (11.2)	7 (7.2)	13 (16.0)	0.288
Once a day	54 (30.3)	29 (29.9)	25 (30.9)	
Several times a week	66 (37.1)	35 (36.1)	31 (38.3)	
Several times a month	25 (14.1)	17 (17.5)	8 (9.9)	
Less than once a month	4 (2.2)	3 (3.1)	1 (1.2)	
Does not consume	9 (5.1)	6 (6.2)	3 (3.7)	
Nuts and seeds				
Several times a day	7 (3.9)	5 (5.2)	2 (2.5)	0.449
Once a day	20 (11.2)	10 (10.3)	10 (12.3)	
Several times a week	65 (36.5)	40 (41.2)	25 (30.9)	
Several times a month	41 (23.1)	21 (21.7)	20 (24.7)	
Less than once a month	12 (6.7)	4 (4.1)	8 (9.9)	
Does not consume	33 (18.6)	17 (17.5)	16 (19.7)	
Sweets				
Several times a day	27 (15.2)	11 (11.3)	16 (19.7)	0.036
Once a day	53 (29.8)	29 (29.9)	24 (29.6)	
Several times a week	72 (40.4)	39 (40.2)	33 (40.7)	
Several times a month	22 (12.4)	18 (18.6)	4 (4.9)	
Less than once a month	1 (0.6)	0	1 (1.2)	
Does not consume	2 (1.1)	0	2 (2.5)	
Self-rated of parents' nutritional knowledge				
Very good	15 (8.4)	9 (9.3)	6 (7.4)	0.784
Good	83 (46.6)	42 (43.3)	41 (50.6)	
Average	72 (40.5)	41 (42.3)	31 (38.3)	
Lack	8 (4.5)	5 (5.1)	3 (3.7)	

<sup>1</sup> – Pearson's *chi*-squared test,  $p \leq 0.05$

vs. 41.2% girls;  $p = 0.036$ ). In the entire study group, there was a relatively high percentage of children who did not eat any legumes (almost 30%), nuts and seeds (almost 19%) or fish (almost 16%).

The correlation between the declared nutritional knowledge of parents and guardians of children (very high knowledge, high knowledge, medium knowledge, lack of nutritional knowledge) in preferences in the consumption of 10 groups of food products is presented in Table 3. In the case of children from families in which parents or caregivers declared a high level of nutritional knowledge, a high correlation was found between the consumption of fruit and vegetables (0.64), and a high correlation coefficient was noted between the consumption of vegetables and whole grains (0.61). The consumption of legumes was highly correlated with the consumption of fruit (0.59), vegetables (0.66) and whole grain products (0.59). On the other hand, meat consumption showed a high correlation with fruit consumption (0.58), and at the same time negatively correlated with the consumption of vegetables (-0.59), whole grains (-0.75), fish (-0.55) and legumes (-0.63). Correlations between the frequency of consumption of selected food product groups by children of

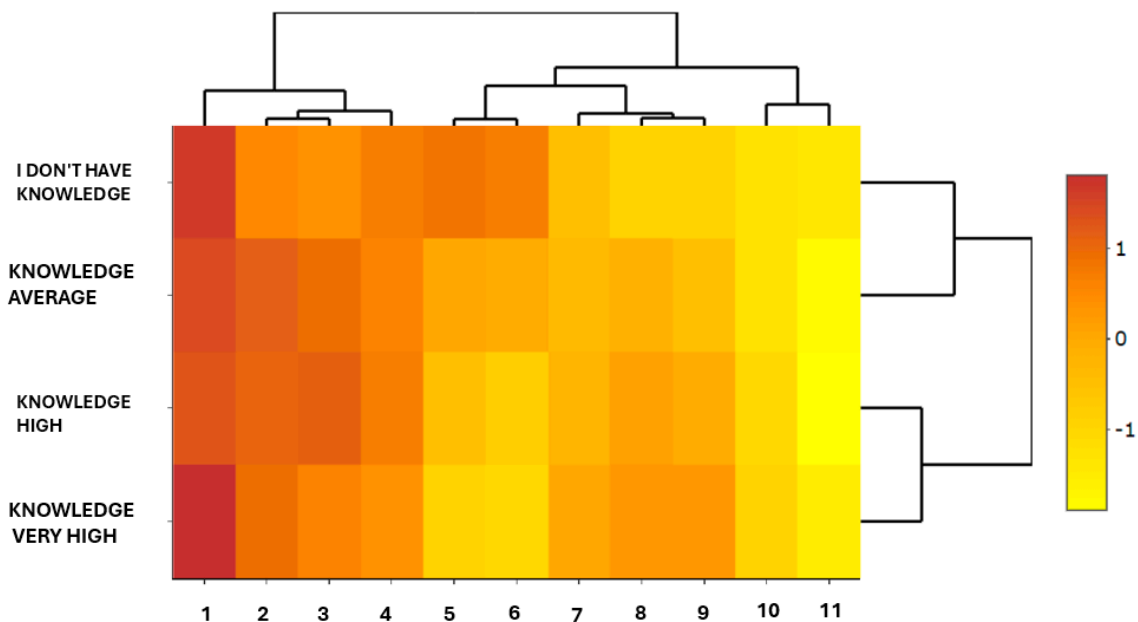
parents or caregivers declaring a lack of nutritional knowledge reached a high level in the case of fruit and vegetable consumption (0.72), as well as between the consumption of eggs and vegetables and eggs and milk (0.72). The consumption of meat and fruit correlated at the level of 0.7 and meat and vegetables at the level of 0.75. For the consumption of cold cuts and fish, a negative correlation was recorded at the level of -0.55. An interesting phenomenon observed is the occurrence of a high positive correlation between the consumption of nuts and seeds and milk, whole grains, fish and eggs, respectively the correlation coefficients corresponded to the levels of 0.75, 0.72, 0.56 and 0.70. The consumption of sweets was negatively correlated with the consumption of whole grains (-0.73) and positively with the consumption of cold cuts (0.73) and legumes (1.00).

The use of statistical analysis based on a scaled heat map (Figure 1) allowed to show hidden relationships between the declared nutritional knowledge of parents and/or caregivers and groups of food products used in children's nutrition. The products whose intake is the most common in all surveyed families, regardless of the declared nutritional knowledge, come to the fore,

Table 3. Calculated Kendall's *tau* correlation coefficients between the declared nutritional knowledge of parents and/or caregivers in relation to the frequency of consumption of selected groups of food products by children

	Knowledge	Fruits	Vegetable	Milk	Whole grain cereal products	Fish	Legumes	Egg	Meat	Cold Cuts	Nuts and seeds
Vegetable	Lack	0.72									
	Average	0.46									
	Good	0.44									
	Very good	0.64									
Milk	Lack	0.12	0.33								
	Average	-0.02	0.07								
	Good	-0.03	0.13								
	Very good	0.18	0.24								
Whole grain cereal products	Lack	0.06	0.32	0.24							
	Average	0.19	0.34	-0.03							
	Good	0.19	0.24	0.09							
	Very good	0.53	0.61	0.27							
Fish	Lack	0.10	0.07	0.22	0.22						
	Average	0.10	0.20	-0.01	0.17						
	Good	0.17	0.1	-0.04	0.23						
	Very good	0.18	0.27	0.23	0.33						
Legumes	Lack	-0.08	0.22	-0.22	0.73	0.22					
	Average	0.21	0.52	0.15	0.47	0.19					
	Good	0.22	0.45	0.01	0.42	0.26					
	Very good	0.59	0.66	0.31	0.59	0.38					

	Knowledge	Fruits	Vegetable	Milk	Whole grain cereal products	Fish	Legumes	Egg	Meat	Cold Cuts	Nuts and seeds
Egg	Lack	0.52	0.72	0.72	0.34	0.18					
	Average	0.03	0.17	0.23	0.17	0.08	0.26				
	Good	0.36	0.34	0.12	0.21	0.09	0.29				
	Very good	0.01	-0.03	-0.08	0.14	0.37	0.04				
Meat	Lack	0.70	0.75	-0.45	0.21	0.31	0.49	-0.59			
	Average	-0.11	-0.01	0.13	-0.23	-0.08	0.00	0.11			
	Good	0.27	0.15	0.18	0.10	0.01	0.02	0.38			
	Very good	0.58	-0.59	-0.07	-0.75	-0.55	-0.63	-0.29			
Cold cuts	Lack	0.12	-0.32	0.32	-0.46	0.22	-0.73	0.06	-0.22		
	Average	-0.22	-0.10	0.01	-0.24	0.02	-0.16	0.06	0.38		
	Good	-0.03	-0.07	0.03	-0.04	-0.06	-0.07	0.16	0.21		
	Very good	-0.04	0.05	-0.17	0.47	-0.55	-0.17	-0.26	0.40		
Nuts and seeds	Lack	0.05	0.44	0.75	0.72	0.56	0.49	0.70	-0.07	-0.21	
	Average	0.33	0.33	-0.02	0.42	0.10	0.35	0.25	-0.09	-0.23	
	Good	0.29	0.14	0.10	0.38	0.12	0.23	0.30	0.26	-0.06	
	Very good	0.33	0.34	-0.03	0.40	-0.10	0.32	0.42	-0.38	0.09	
Sweets	Lack	0.08	-0.22	0.22	-0.73	0.56	1.00	-0.08	-0.49	0.73	-0.49
	Average	-0.20	-0.29	0.24	-0.40	-0.14	-0.25	0.02	0.20	0.32	-0.22
	Good	-0.03	-0.14	0.10	-0.24	-0.20	-0.34	-0.14	0.16	0.18	-0.18
	Very good	0.33	0.10	0.34	0.29	0.04	0.19	-0.24	-0.13	-0.24	0.04



X-axis description: 1 – Consumption of meat, 2 – Consumption of milk, 3 – Consumption of fruits, 4 – Consumption of eggs, 5 – Consumption of sweets, 6 – Consumption of cold cuts, 7 – Consumption of vegetables, 8 – Consumption of nuts and seeds, 9 – Consumption of whole grain cereal products, 10 – Consumption of legumes, 11 – Consumption of fish

Figure 1. Influence of the frequency of consumption of selected groups of food products used in children's nutrition to the suggested level of nutritional knowledge of parents and caregivers (heat map)



and this group includes the consumption of meat, milk, fruits and eggs. It is clear that the frequency of consumption of sweets and cold cuts is lower, and seeds and nuts and whole grain cereal products bread is higher in families where parents or caregivers indicated the level of their nutritional knowledge to be very high and high. The scaled heat map also indicates that the frequency of fish consumption is the lowest among the given groups of food products and does not depend on the declared knowledge of parents.

## DISCUSSION

The relationship between children's diet at home and subsequent eating habits has been the subject of many scientific studies [18-24]. Our study confirmed irregularities in the children's diet. We found insufficient consumption of fish and legumes by the entire study group, regardless of the child's gender and the parent's self-assessment of nutritional knowledge. According to Silva [19], patterns of food consumption begin to form in the earliest moments of life and continue throughout childhood. Early experiences with the consumption of specific foods are critical for the acceptance and consolidation of later eating habits.

The correlational analysis of our research showed the existence of relationships between the frequencies of consumption of individual groups of food products, and these associations depended on the declared nutritional knowledge of parents and caregivers. Particularly noticeable differences occurred in the case of the frequency of fruits and vegetables consumption by children of parents and caregivers declaring a high level of their nutritional knowledge. In this case, a high positive correlation (0.72) was observed, what was not reflected in the other study groups. Simultaneously, it should be noted that there was a high negative correlation for the consumption of meat and whole grain cereal products. Which carries the information that with frequent meat consumption, the frequency of consumption of whole grain cereal products by children decreases and vice versa. Leal et al. [20] in their study among 7- and 10-year-olds found that the consumption of fruit and vegetables was too low, but this trend concerned families with low socioeconomic status and low level of parental education. Similar relationships related to parents' food choices for their children, depending on the level of knowledge, have been shown in their research by Ma L et al. [21]. Olfert et al. [22] noted in their research that special care should be given to the relationships that are formed between parents and their children on the basis of joint grocery shopping and meal preparation. On the other hand, Riasatian et al. [23] postulated that eating habits should be shaped as early as preschool children. And one of the important elements would be

to include properly prepared educational games with elements of nutritional knowledge in the process of their formation. According to Fazrin et al. [24], there is a large influence between the role of parents in preparing a balanced menu and the nutritional status of children. In the literature on the subject, there are no unambiguous studies linking the frequency of consumption of food products by children depending on the declared nutritional knowledge of parents or caregivers. In the research of Vlieger et al. [25], an attempt was made to demonstrate the relationship between the impact of nutritional education in primary school on the nutritional attitudes of parents and their children. The examined children correctly sorted fruit and vegetables in terms of health, while uncertainties appeared in the case of cold cuts and muesli bars. The parents of the children also tried to actively participate in the nutritional education of their children, but nevertheless suggested that they felt insecure about their own level of knowledge about children's nutrition. It is the results of our own research that indicate how important in the nutritional education of children is the nutritional awareness of parents. In the case of parents indicating a lack of nutritional knowledge and its average level, irregularities in the frequency of consumption by their children of food products important for maintaining health can also be noticed. Correlational analysis showed the existence of a high positive correlation between the frequency of consumption of sweets and wholegrain cereal products (0.73), as well as sweets and legumes (a correlation coefficient of 1.00), as well as sweets and cold cuts and sweets and wholegrain cereal products (both 0.73). Such high correlations were not recorded in the case of the frequency of consumption of food product groups by children of parents declaring an average, good and very good level of their nutritional knowledge. Such correlation indicators indicate that the frequency of consumption of sweets is at the level of consumption of legumes, whole grain cereal products and cold cuts. Such a relationship was not observed in the case of children of parents declaring a high and medium level of their nutritional knowledge. The problem of the frequency of fish consumption in children, parents or guardians has been noticed, regardless of the declared level of their nutritional knowledge. The calculated correlation coefficients assumed weak or low levels. Problems with the frequency of fish consumption by early school children have also been noted in their studies by Menor-Rodriguez et al. [26]. Undoubtedly, nutritional education started as early as possible brings health benefits at a later age, i.a. lower body mass index (BMI) and reducing the risk of developing type 2 diabetes [25, 27-29]. Mahmood et al. [30] in a meta-analysis showed that appropriate parenting practices aimed at encouraging the consumption of healthy food

products, but without excessive pressure to implement them, are particularly beneficial. Czarniecka-Skubina et al. [31] showed that the process of health and nutritional education of children cannot be conducted separately from the health education of their parents. Active forms of nutritional education in the form of workshops related to theoretical issues are particularly desirable. Even one-off educational campaigns bring benefits related to changes in the eating and health habits of early primary school students towards increasing the consumption of fruit and vegetables or whole grain products [32].

However, in the subject matter of the subject, one can also come across a slightly different view of the role of parents, and in particular mothers, on shaping the child's eating habits. Namely, Kadir [33] in his work shows that there is no relationship between knowledge about parenting and the nutritional status of a preschool child. But he did notice the existence of a relationship between cultural parenting and the state of the child's nutrition. Such a way of looking at it marks the area of greater influence of culture than nutritional knowledge. Such cases can occur in particular in people with a low level of developed nutritional awareness. The topic of the impact of awareness on the food choices of parents and children attending primary school was addressed in Nahid's research [34]. Taking into account many factors influencing conscious food choices, he determined that without the support of an appropriate education system, the introduction of the principles of healthy eating by parents by parents is not very effective. The use of the heat map by us allowed for a deeper look into the dimension of the research space related to the results of own research on the parent-child relationship at the level of frequency of consumption of selected food groups and the suggested nutritional knowledge of parents. The area of differences in the frequency of consumption of selected groups of food products by children, depending on the declared nutritional knowledge has been clearly marked. Children of parents and caregivers declaring a very high and high level of nutritional knowledge in relation to children of parents and caregivers declaring no nutritional knowledge or its average level consumed sweets and cold cuts less often. And more often their menu included seeds and nuts as well as whole grain cereal products. The frequency of consumption of individual groups of food products by children is conditioned by the formation of eating habits, which should be shaped from an early age [30, 35-38].

## CONCLUSIONS

1. Girls were more likely to eat fruit and vegetables, while boys were more likely to eat meat, cold cuts and sweets.
2. Stronger correlations in the frequency of consumption of individual groups of food products by children were observed in the case of parents or guardians declaring the level of their nutritional knowledge as high.
3. The gender of the child was an important factor in the differences, the frequency of consumption of vegetables, fruits, meat and sweets.
4. The frequency of consumption of individual groups of food products is correlated with the declared nutritional knowledge of parents.
5. Children of parents declaring their nutritional knowledge as very high were less likely than children of parents declaring a lower level of nutritional knowledge to eat sweets and cold cuts, and more often seeds and nuts, and whole grain cereal products.
6. To sum up your research, it should be emphasized that an important element in shaping children's attitudes and eating habits is the nutritional awareness and knowledge of parents. whose task is to transfer and consolidate their correctness in their charges. However, for more complete modelling, prudent educational and practical actions are needed among children, parents and educational institutions.

### Conflict of interest

*The authors declare no conflicts of interest.*

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