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An Assessment of the Energy and Nutritional Value of Menus Delivered by a Catering Company in a Selected Kindergarten in Wrocław and Parental Awareness Regarding Dietary Recommendations

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Abstract

Objective: The proper nutrition of preschool children is one of the key elements supporting their physical and mental development and intellectual agility. With the increasing awareness of the role of diet in preventing lifestyle diseases, there is a growing need for comprehensive education and the development of healthy eating habits from an early age. In this regard, parents and caregivers face the significant challenge of providing adequate and balanced diets that meet the individual nutritional needs of their children. This study aimed to estimate the energy and nutritional value of decadal menus provided by a catering company in a selected kindergarten in Wrocław. Additionally, a proprietary survey questionnaire assessed parental awareness of nutritional recommendations.

Methodology: Forty dietary plans were analysed using the Dieta 6D computer software. The energy value and content of nutritional components, such as protein, fats, carbohydrates, mineral components (calcium, iron), and vitamins (A, C), were estimated in decadal menus for each season. In the second part of the study, parental awareness of nutritional recommendations was assessed. A survey questionnaire was prepared and directed to parents or guardians of preschool-aged children.

Results: A qualitative analysis of 10-day dietary allowances showed them as being composed based on the principles of healthy eating, taking into consideration variety, seasonality of products, and diverse cooking techniques. The menus differed in meeting children's needs for vitamins and mineral components. Regardless of the season, they provided an excessive amount of vitamin A compared

to recommended norms, while vitamin C intake exceeded recommended norms in summer. Calcium content was consistently below dietary recommendations for the age group of 4 to 6 years. Only the iron content complied with the norms, regardless of the season. The survey research results indicate that parents of preschool-aged children pay close attention to nutrition in preschool facilities. When acquiring knowledge about the nutrition of 3-6-year-old children, parents rely on information from their relatives and dietitians rather than scientists specialising in children's nutrition. Unfortunately, regarding knowledge about the dosage of vitamin D, only 35% of parents with higher education knew the appropriate dosage of vitamin D required at this age.

Implications and recommendations: The assessment of preschool menus indicated the necessity of changes regarding their composition modifications, including adding legume seeds into the diet and limiting meals containing simple sugars. The knowledge and dietary attitudes of preschool teachers and parents play a significant role in shaping children's dietary habits. Research has shown that inadequate or excessive intake of nutrients, 'picky eating' behaviour, and lack of knowledge about nutrition among teachers and staff are common issues in preschools. Therefore, interventions focusing on improving knowledge and dietary attitudes among teachers and parents are essential.

Keywords: decadal menu plans, nutritional value assessment, child nutrition

1. Introduction

The proper nutrition of preschool children is one of the key elements supporting and influencing their physical and mental development and emotional and intellectual agility. In recent years, negative changes in dietary habits and insufficient physical activity have become increasingly noticeable, leading to adverse health consequences. With the growing awareness of the role of diet in preventing lifestyle diseases such as obesity, type 2 diabetes, and cardiovascular diseases, there is an increasingly recognised need for comprehensive education and the formation of healthy eating habits from an early age. In this regard, parents and caregivers face the significant challenge of providing adequate and balanced diets that meet the individual nutritional needs of their children (Wierzejska, 2011).

Contemporary legislative guidelines and dietary recommendations developed by nutrition and public health experts, such as the World Health Organization (WHO) and local health institutions, emphasise the importance of a comprehensive approach to nutrition during the preschool years. They recommend a diet rich in the diverse nutrients necessary for proper development while highlighting the need to limit highly processed products rich in simple sugars and saturated fatty acids. In the context of dietary habits, it is essential to consider that food preferences and dietary habits are shaped early in childhood and can have a long-term impact on health in adulthood. Therefore, nutritional education for parents and caregivers and implementing healthy eating principles in the educational environment become obligatory elements in promoting a healthy lifestyle (Charzewska and Chwojnowska, 2008).

This study aimed to estimate the energy and nutritional value of decadal menus provided by a catering company in a selected kindergarten in Wrocław, covering all seasons. Additionally, a proprietary survey questionnaire assessed parental awareness of nutritional recommendations.

2. Foundations of Healthy Nutrition

2.1. Role of Nutrients

Nutritional requirements vary depending on the age and physical activity of children. Proper nutrition is crucial during preschool, characterised by intense physical and mental development. Anabolic processes, which are responsible for growth, outweigh catabolic processes, which generate a high

demand for nutrients. Deficiencies can lead to health problems such as being underweight or delayed mental development. At the same time, an excess of energy intake increases the risk of being overweight and obese, which can persist into adulthood. Regarding dietetics, the nutrition of preschool-aged children is an essential area of research and recommendations. Various scientific institutions and expert groups, such as the Institute of Mother and Child, the Institute of Food and Nutrition in Poland, the European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN), as well as the American Academy of Pediatrics (AAP), have developed detailed dietary recommendations, regarding the qualitative aspect of nutrition (Department of Health and Ageing, 2013; Jarosz, 2019).

According to current dietary guidelines, in preschool nutrition, the contribution of energy from protein in the diet is recommended to cover 10 to 20% of the daily requirements. However, exceeding 15% is not advisable to avoid adverse effects from excessive protein intake per 1 kg of body weight. An excess of protein burdens the excretory system and may contribute to obesity, while too low protein intake in the diet can lead to growth inhibition and developmental disorders (Wolnicka et al., 2021).

The carbohydrate intake for this age group should be around 130 grams daily, which constitutes 45 to 65% of the total calorie intake. However, it is essential to remember that the added sugar intake should not exceed 10% of the total amount of consumed carbohydrates, according to the WHO definition, which includes all simple sugars added during food processing and derived from juices, syrups, and honey (Taraszewska et al., 2021).

According to the recommendations, the proportion of energy derived from fats in the diet should be around 30%, particularly unsaturated fats, such as those found in olive oil, fish, and avocado. For children aged 1-3 years, this proportion is suggested to be slightly higher, around 35% of the daily energy requirement. Saturated fats must not exceed 10% of the total fat consumed, as their excess may lead to being overweight, obesity, and cardiovascular diseases (Jaczewska-Schuetz et al., 2021).

The conclusions drawn from scientific research indicate that a diet consistent with nutritional recommendations can promote healthy growth and development in children and prevent future diet-related diseases. Based on solid scientific foundations, the recommendations provide practical guidelines for balancing the diet in the context of the nutritional needs of preschool children (Sobotka, 2013).

2.2. Nutrient Requirements

A healthy diet for preschool children should include regular meals and snacks throughout the day. An appropriate meal schedule is crucial to ensure children receive the necessary nutrients to support their healthy growth and development. Children spending approximately eight hours in preschool typically receive three meals (second breakfast, lunch, afternoon snack), which should provide about 75% of their daily energy intake, i.e., approximately 1050 kcal. The remaining 30% of energy should be supplied by meals consumed at home, namely breakfast and dinner (see Table 1) (Jarosz, 2019).

Practical meal planning advice:

1. Variety: diversifying the menu is crucial. Children should be taught to eat various foods, seasoning them mildly.
2. Protein: should primarily be provided in the form of lean poultry, fish, milk, and its derivatives.
3. Limitations: avoid heavy, greasy, and fried foods.
4. Nutritional awareness of caregivers: caregivers need to be aware of the composition of meals served in preschools to adequately supplement the daily nutritional intake at home (Weker et al., 2020).

Breakfast should include whole grain cereals, which provide fiber and complex carbohydrates for energy (e.g., 80-150 g of whole wheat bread for children aged 1-6 years), and can be supplemented with protein from eggs or low-fat dairy products. The second breakfast should consist of servings of

fruit, which is a source of vitamins, minerals, and fiber (e.g. 250-350 g, depending on age). Lunch should provide protein for tissue building and regeneration, derived from lean meat, fish, legumes, and vegetables, which provide vitamins and micronutrients (approximately 650-700 g of vegetables and fruits combined). Afternoon snacks may consist of another smaller portion of dairy products, such as yogurt or kefir, supporting the health of the digestive system. Dinner should be light, consisting, for example, of whole grain bread and lean sources of protein, such as cheese or poultry. Providing children with adequate fluids and avoiding sugary drinks is essential throughout the day. Fats should be provided in the form of healthy vegetable oils, and consuming sugars and sweets should be limited. Meals must be balanced and regular, which supports metabolism and helps avoid overeating (Wolnicka et al., 2021).

Table 1. Recommendations for the nutritional value of a daily diet and preschool meals

Nutrients	Units	Age (years)	
		1-3	4-6
Energy			
Throughout the day	kcal	1000	1400
Preschool meals (75%)	kcal	750	1050
Protein (should not exceed 15%)			
Throughout the day	g	14	21
Preschool meals (75%)	g	10.5	16
Fats (30-35% of energy)			
Throughout the day	g	33-30	47-54
Preschool meals (75%)	g	25-29	35-40
Carbohydrates			
Throughout the day	g	130	130
RDA	g	approximately 140	approximately 196
Recommended (amount to be included)		(56% of energy)	(56% of energy)
Preschool meals (75%)	%	55-65% energy	55-65% energy
Calcium			
Throughout the day	mg	500	700
Preschool meals (75%)	mg	375	525
Iron			
Throughout the day	mg	7	10
Preschool meals (75%)	mg	5.25	7.5
Vitamin A			
Throughout the day	µg of retinol equivalent	400	450
Preschool meals (75%)		300	337
Vitamin C			
Throughout the day	mg	40	50
Preschool meals (75%)	mg	30	37.5

Source: own compilation based on (Jarosz, 2019).

3. Materials and Methods

3.1. Menu Assessment

The study encompassed the evaluation of menus sourced from a kindergarten located in the Wrocław area, utilising catering services. Within the selected kindergarten, three groups were operational, each consisting of approximately twenty children aged four to six.

An assessment was conducted on ten randomly selected full-day dietary allowances for each season, as the analysed institution employed a decadal menu planning system. In total, 40 dietary plans were examined. Using the computer software Dieta 6D (IŻŻ, Warsaw), the energy value and content of nutritional components such as protein, fats, carbohydrates, mineral components (calcium, iron), and vitamins (A, C) were estimated in the decadal menus for each season.

The study considered losses associated with technological processes, therefore those applied at a level of 10% for energy value, total protein, fats, carbohydrates, calcium, and iron, 20% for vitamin A, and 55% for vitamin C (Kunachowicz et al., 2005). It was assumed that consumption values deviating by ±10% from the norm were correct. Then, the results obtained in the analysis were compared with the applicable standards and recommendations for the nutrition of children aged 4-6, weighing 19 kg, and engaging in moderate physical activity. It was assumed that preschool nutrition should provide 75% of the recommended daily allowance for energy and nutrients for this age group of children (Cichocka, 2011).

Excel software was used for result analysis, calculating the arithmetic mean and standard deviation.

3.2. Parental Awareness Evaluation Regarding Child Nutrition

The second part of the study assessed parental awareness regarding nutritional recommendations for children aged 4 to 6. A proprietary survey questionnaire was prepared and directed to parents or guardians of preschool-aged children to obtain the necessary data. The study was conducted from May 2023 to June 2023 among parents of children attending kindergartens in the Wrocław area and its surroundings. The questionnaire was previously validated. The study was conducted anonymously using the Computer Assisted Web Interview (CAWI) method, which provided the respondents with a link to a website containing the questionnaire.

The scope of collected data included socio-demographic questions regarding the parent (gender, age, size of residential area, education) and the demographic-anthropometric characteristics of the child (gender, age, body weight, and height). The next part of the survey consisted of 16 questions focusing, among other things, on whether children consume regular meals, what food products they consume and how often, and where their guardians obtain information regarding proper child nutrition.

The provided questionnaire comprised:

- Closed-ended questions:
  - single-choice questions,
  - multiple-choice questions.
- Semi-open questions.
- Open-ended questions containing short responses from the respondent.
- Conditional questions (available to respondents who provided a specific answer to the previous related question) (Połomski and Konarski, 2021).

The study conducted in two selected preschools in Wrocław and through social media involved 64 respondents, of whom 62 were women, and 2 were men whose children attended preschool. The average age of the surveyed group was 35, ranging from 25 to 45, including individuals of both genders. The analysis of the results was conducted using Excel software. The arithmetic mean and the percentage shares of the respondents' answers were calculated.

4. Results and Discussion

4.1. Menu Assessment

The energy and nutritional value of randomly selected ten-day menus provided by a catering company in the chosen preschool in Wrocław were assessed, taking into account all meal times. The results of the estimated energy value and nutrient content in the preschool menus are presented in Table 2, whilst recommendations regarding the nutritional value of preschool meals are provided in Table 3.

Throughout the day, four meals were served at the preschool, namely breakfast, second breakfast, lunch, and afternoon snack, consumed at fixed times according to the principles of balanced nutrition. Breakfast was served at 8:30 AM, second breakfast at 11:30 AM, lunch at 2:00 PM, and afternoon snack at 3:30 PM. The meal intervals were irregular, i.e., 3, 2.5, and 1.5 hours, respectively.

Table 2. Energy value and nutritional content in preschool menus depending on the season

Energy and nutrients	75% of daily requirements	Spring		Summer		Autumn		Winter	
		$\bar{X}$ ±SD	Fulfillment of the norm [%]	$\bar{X}$ ±SD	Fulfillment of the norm [%]	$\bar{X}$ ±SD	Fulfillment of the norm [%]	$\bar{X}$ ±SD	Fulfillment of the norm [%]
Energy (kcal)	1050	1168.4 ±120.4	111.28	1122.4 ±97.2	106.90	1241.0 ±131.7	118.19	1187.3 ±113.4	113.07
Total protein (g)	min. 15.8	39.1 ±3.9	247.25	37.0 ±1.5	233.95	40.2 ±4.0	254.64	40.5 ±5.1	256.45
Fat (g)	35.3	38.8 ±7.7	109.90	36.0 ±9.4	101.92	41.5 ±3.0	117.57	36.8 ±7.4	104.15
Carbohydrates (g)	167.3	161.4 ±17.4	96.50	166.2 ±23.6	99.33	179.8 ±31.9	107.47	163.4 ±12.2	97.67
Calcium (mg)	750	362.0 ±86.0	48.27	406.9 ±101.7	54.25	380.0 ±170.5	50.67	465.0 ±163.1	62.00
Iron (mg)	7.5	6.8 ±1.1	90.13	7.2 ±2.5	95.66	7.5 ±2.9	99.99	7.0 ±0.9	93.31
Vitamin A (µg)	337.5	528..8 ±148.4	156.67	589.6 ±141.4	174.69	630.2 ±179.7	186.74	622.8 ±121.5	184.52
Vitamin C (mg)	37.5	37.3 ±15.4	99.45	59.7 ±31.0	159.19	36.4 ±18.8	97.08	39.0 ±21.8	104.02

Explanations: $\bar{X}$ – mean value from 10 menus; SD – standard deviation.

Source: own elaboration.

Table 3. Recommendations for the nutritional value of preschool meals (at 75% of recommended intake) per child/day

Energy and nutrients	Recommended nutritional values for preschool nutrition	
	1-3 years	4-6 years
Energy	750 kcal	1050 kcal
Total protein	min. 10.5g	min. 15.8 g
Total fat	29.3 g (35% of energy from fat)	35.3 g (30% of energy from fat)
Saturated fatty acids	As low as possible, not exceeding 10% of energy	
Carbohydrates	The quantity depends on the % contribution of energy from proteins and fats.	
Minerals		
Sodium	562.5 mg	750 mg

Potassium	600 mg	825 mg
Calcium	525 mg	750 mg
Phosphorous	345 mg	375 mg
Magnesium	60 mg	97.5 mg
Iron	5.25 mg	7.5 mg
Zinc	2.25 mg	3.75 mg
Copper	0.225 mg	0.3 mg
Manganese	0.9 mg	1.13 mg
Selenium	15 µg	22.5 µg
Iodine	67.5 µg	67.5 µg
Vitamins		
Thiamine – B1	0.375 mg	0.45 mg
Riboflavin – B2	0.375 mg	0.45 mg
Niacin	4.5mg	6 mg
Vitamin C	30 mg	37.5 mg
Vitamin A (as retinol equivalent)	300 µg	337.5 µg
Vitamin E (as alpha-tocopherol equivalent)	4.5 mg	4.5 mg
Vitamin K	11. 25 mg	15 mg
Vitamin B6	0.375 mg	0.45 mg
Vitamin B12	0.675 µg	0.9 µg
Vitamin D	11.25 µg	11.25 µg
Folates	112.5 µg	150 µg
Dietary Fiber	7.5g	10.5 g

Source: own elaboration based on (Jarosz, 2020).

The meals were prepared using various culinary techniques such as frying, boiling, stewing, and baking. The diversity in cooking methods allowed for obtaining various versions of dishes prepared with the same ingredients. It is worth noting that the analysed meals were diverse, and the seasonality of products was visible. In the autumn-winter period, pickled cucumbers and cabbage were served, and among fruits, there were pears, plums, apples, and bananas, whereas fresh vegetables and fruits were served during the spring-summer period, including strawberries, watermelons, nectarines, dill, green cucumbers, and lettuce. The dishes were carefully selected based on flavour variety, aromas, and colour. Honey and homemade syrups were added instead of sugar to sweeten dishes and beverages. Various oils were used in meal preparation, including flaxseed, rapeseed, and olive oil. The menus were enriched with various types of groats (barley, buckwheat, millet), rice (brown, white, parboiled), and pasta (whole grain, egg, durum wheat).

The caloric value of the meals offered in the preschool ranged from 1122.4 kcal in summer to 1241.0 kcal in autumn. The analysis of the obtained results showed that the energy value of the examined menus was inappropriate and exceeded the recommended 75% of the energy requirement norm in preschool nutrition. Some researchers (Frąckiewicz et al., 2011; Orkusz and Włodarczyk, 2014; Orkusz et al., 2018) also demonstrated in their studies that energy consumption in preschool diets was too high.

The total amount of protein in the analysed preschool menus did not show significant differences depending on the season. It significantly exceeded the norms, i.e. the recommended minimum daily intake of 15.8 g in meals offered at the preschool. The fulfillment of the protein norm was highest in winter, reaching 256.45%, and lowest in summer at 233.95%. A high-protein diet may strain the

liver and kidneys, promoting calcium excretion in urine (Jarosz, 2012; Delimaris, 2013). Additionally, an excess of protein in the diet of young children increases the risk of obesity and can lead to metabolic disorders, such as higher insulin levels (Jarosz, 2012). There are inconsistencies in the norms stating that, on the one hand, the daily protein intake for children of this age should be 21 g (Jarosz, 2017). On the other hand, it is recommended to consume 10-15% of the total daily energy from protein (Regulation of the Minister of Health of July 26, 2016), which amounts to approximately 35.0-53.0 g. Similarly to this study, Frąckiewicz et al. (2011), Orkusz and Hapanowicz (2016) also noted a higher than recommended protein content in preschool meals. However, Orkusz and Olech (2014) and Orkusz and Włodarczyk (2014) observed a protein content meeting the norm.

In the menus under scrutiny, the fat content exhibited no statistically significant variances across the seasons, remaining within the standard ranges during spring, summer, and winter. However, during autumn, the fat content surpassed acceptable levels. The average fat content in the examined diets ranged from 36.00 g in summer to 41.50 g in autumn, when the fat requirement was met at 117.57%. The results of this research differ from the literature data on preschool children's nutrition, which indicate an excess of fats in preschool meals (cf. Frąckiewicz et al., 2011; Orkusz and Olech, 2014; Orkusz and Włodarczyk, 2014; Okrusz et al., 2018).

The carbohydrate content in the analysed diets did not differ significantly depending on the season and ranged from 161.4 g in spring to 179.8 g in autumn. Comparing the obtained results with the recommended carbohydrate intake, it can be concluded that the amount of carbohydrates in the examined preschool meals aligns with the norms. Orkusz and Olech in (2014) also showed that preschool menus presented a balanced amount of carbohydrates, regardless of the season. Excessive consumption of sugars by preschool-aged children can promote tooth decay during this period and, in the long term, may contribute to being overweight or experiencing obesity-related problems (Bagińska and Stokowska, 2006).

Regardless of the season, a significant calcium deficiency was observed in the examined menus, and the quantity ranged from 362.0 mg in spring to 465.0 mg in winter (the recommended norm is 750 mg). An insufficient amount of calcium in the diet has an adverse effect, especially for children, because, in the case of dietary calcium deficiencies, the body replenishes them at the expense of bone tissue, leading to an accelerated loss of bone density (Marcinowska-Suchowierska, 2001). As a result, this can lead to spinal deformities, weakened bones, dental damage, and an increased risk of osteoporotic changes later in life (Sawicki et al., 2008). Calcium deficiency in the diet can also contribute to the development of cardiovascular diseases (Bolesławska et al., 2009).

The low calcium intake in the studied menus might have been influenced by insufficient milk and dairy products (e.g. kefir and cottage cheese), which are the primary sources of calcium in the diet. Other researchers also noted insufficient calcium intake in diet, starting from nurseries (Harton and Myszkowska-Ryciak, 2018), through preschools (Charzewska and Weker, 2006; Merkiel and Chalcarz, 2016; Orkusz and Olech, 2014; Orkusz and Włodarczyk, 2014; Sochacka-Tatara et al., 2008), and also in the case of adolescents (Leszczyńska and Bieżanowska-Kopeć, 2005; Przysiężna et al., 2002), ending with adults (Król et al., 2005; Leszczyńska and Bieżanowska-Kopeć, 2005). According to some reports (Przysiężna et al., 2002), insufficient calcium intake occurs in the diets of various social groups, regardless of the measurement method, whether analytical or computational, and irrespective of the type of data, whether dietary interviews, warehouse reports, or laboratory food ration analysis.

Similarly to carbohydrates, iron was supplied to children in the appropriate amount throughout the year. The iron content ranged from 6.8 mg in spring to 7.5 mg in autumn, meaning that this element's daily intake met 90.13% and 99.99% of the norm. The correct amount of iron in preschool menus was achieved through properly balanced provision of meat, cold cuts, whole grain products, sunflower, and pumpkin seeds. However, it is worth remembering that an excess of iron in the diet may increase the risk of cancer and contribute to various disorders, such as gastrointestinal disorders, atherosclerosis, strokes, Alzheimer's, and Parkinson's diseases (Charkiewicz et al., 2011; Jarosz, 2012). Insufficient iron

intake in the body can lead to various symptoms, such as changes in the mucous membranes of the oral cavity and esophagus, fatigue, anemia, and disorders in the functioning of the nervous and immune systems (Biesalski and Grimm, 2007).

The vitamin A content in the examined menus was over 1.5 times higher than the norm. The demand for vitamin A was met at 156.67% in spring, 174.69% in summer, 184.52% in winter, and 186.74% in autumn, with its content ranging from 528.8 µg in spring to 630.2 µg in autumn. Exceeding the recommended dose of vitamin A is harmful to the body, and can manifest itself in symptoms such as vomiting, loss of appetite, headaches, dry skin, irritability, and gastrointestinal abnormalities including liver and spleen enlargement (Włodarek et al., 2014). Excessive intake of this vitamin norms in preschool diets was also noted by Orkusz and Olech (2014), Orkusz and Włodarczyk (2014), Orkusz and Hapanowicz (2016) and Orkusz et al. (2018).

The vitamin C content was adequate in the analysed menus, with only an excess noted during the summer. The requirements were met at 97.08% in autumn, 99.45% in summer, 104.02% in winter, and 159.19% in summer. The high content of vitamin C in the summer (59.7 mg) in the examined menus was due to the abundant supply of fruits and vegetables rich in this vitamin (parsley, peppers, blackcurrants, strawberries, lemon, and kiwi). The research results diverged from the literature data, which found insufficient amounts of vitamin C in menus offered in preschools (Leszczyńska et al., 2007; Merkiel and Chalcarz, 2016; Orkusz and Olech, 2014; Orkusz and Włodarczyk, 2014; Orkusz et al., 2018), while excessive intake of vitamin C was found by Orkusz and Hapanowicz (2016).

4.2. Parental awareness evaluation regarding child nutrition

In the second part of the study, parents' awareness of dietary recommendations was assessed using a proprietary questionnaire survey with 64 respondents participating in the study, namely 62 women and 2 men whose children attended preschool. The surveyed group ranged from 25 to 45 years of age (both men and women), with an average age of 35. The women constituted a significant majority, accounting for 96.9% of all the respondents. According to M. Tanner-Blasier, spokesperson for the American Dietetic Association, mothers are primarily responsible for grocery shopping, meal preparation, and serving meals at the table (Davis, 2022).

More than half of the respondents (68.8%) had a higher education (Figure 1), while a smaller percentage had a secondary education. On average, every third woman declared having a secondary education; the smallest percentage of the respondents were individuals currently studying (1.6%).

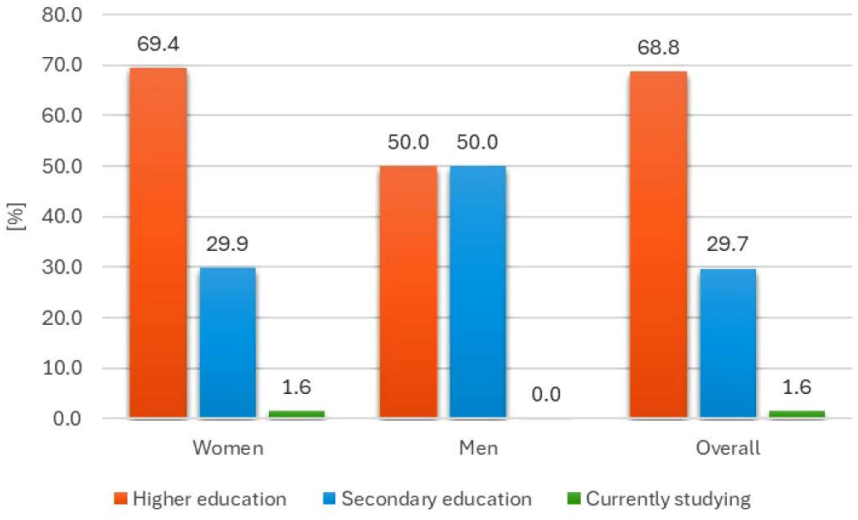

Figure 1. Percentage distribution of respondents by education

Source: own elaboration based on survey results (*N* = 64).

Regarding the gender of the children whose parents participated in the survey. boys accounted for 51.6%. while girls accounted for 48.4%. More than half of the children (51.6%) were aged 4, and only 12.5% were 6. It can be observed that among the 4-year-olds, girls predominated, while in the age group of 5-6, there were significantly more boys (Figure 2).

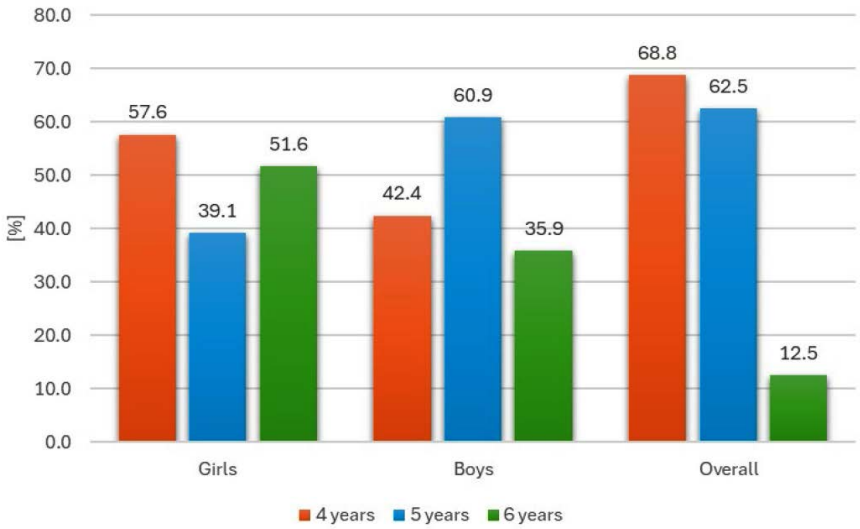

Figure 2. Percentage distribution by child's age

Source: own elaboration based on survey results (*N* = 64).

The study revealed that with age, there is a gradual escalation in the disparity in body mass between females and males (Figure 3). A comparable trend concerning height is observable as the years elapse, augmenting the difference in height between females and males (Figure 4). This variance emerges during the adolescent growth surge in males, manifested by a distinct alteration in growth velocity, increased muscle mass, and enhanced muscular strength. However, the BMI values of the children lie between the 25th and 50th percentiles, indicating that they are within the normal range for the respective age group of 4-6 (Figure 5).

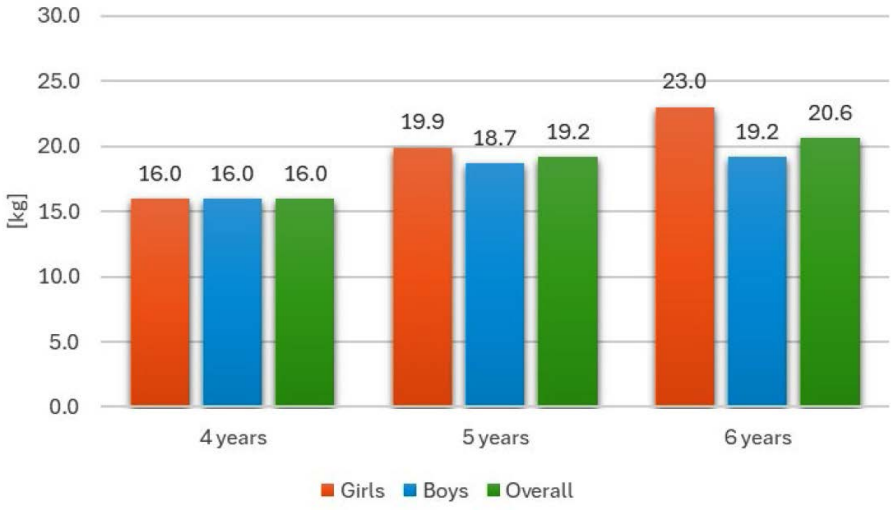

Figure 3. The average body mass of the children [kg]

Source: own elaboration based on survey results (*N* = 64).

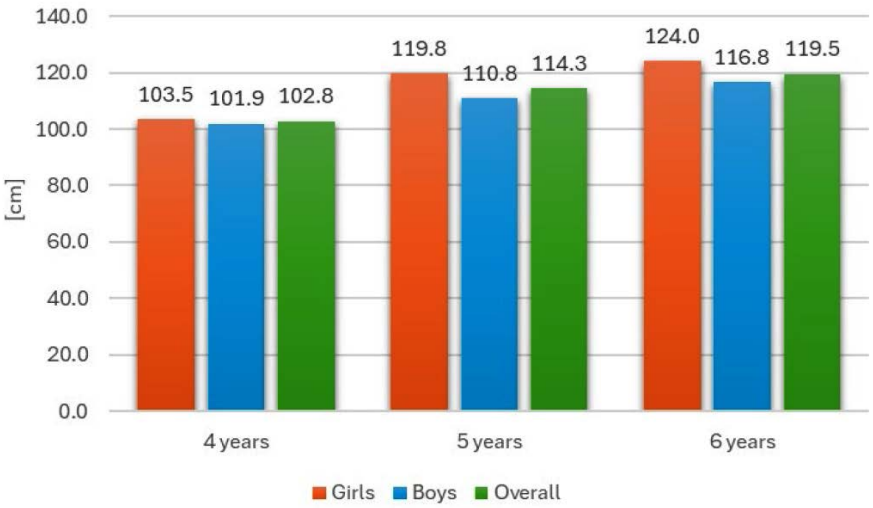

Figure 4. The average height of the children [cm]

Source: own elaboration based on survey results (*N* = 64).

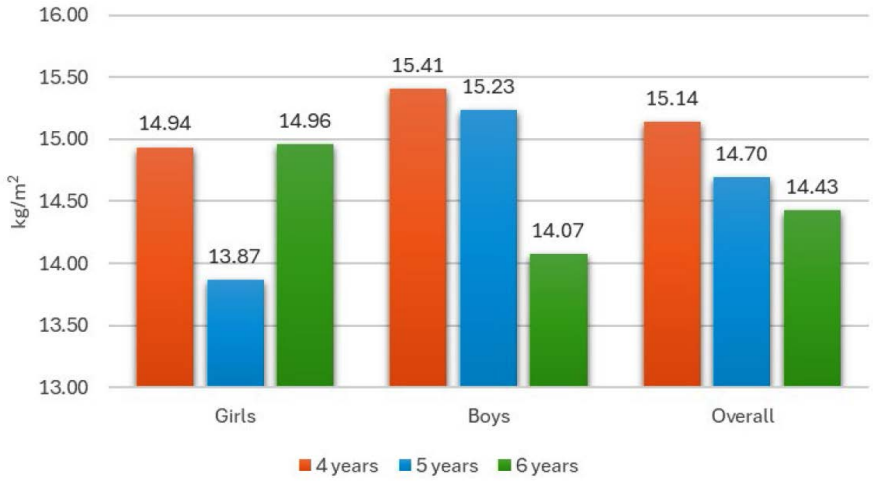

Figure 5. The Body Mass Index values of the children [kg/m^2]

Source: own elaboration based on survey results (*N* = 64).

The primary sources of information on children's nutrition for the respondents were mobile apps on nutrition (35.95%), friends and relatives (37.5%), and dietitians (34.4%), with only 18.8% mentioning books and scientific articles (Figure 6). The respondents least often used artificial intelligence (ChatGPT) for this purpose. In the studies by Szczepańska et al. (2014) and Łukasik (2014), parents indicated family or friends as one of the most common sources of acquiring information.

In the context of preschoolers' nutrition, proper distribution of meals is essential. According to the recommendations of the National Food and Nutrition Institute, children and adolescents should consume 4 to 5 meals a day, with intervals between them not less than 2.5 hours but not exceeding 4 hours (Barańska et al., 2020). In the studied group, 56.3% of parents indicated that their child consumes five meals a day, 31.3% stated that their child eats four times a day, 9.4% of children eating more than five times a day, whilst 3.1% of the parents indicated that their child consumes three meals a day (Figure 7). The research results on the daily amount of meals consumed are similar to the data reported by (Newerli--Guz and Kulwikowska, 2014). Szczepańska, 2014 and Harton, 2015, also observed regularity of meals.

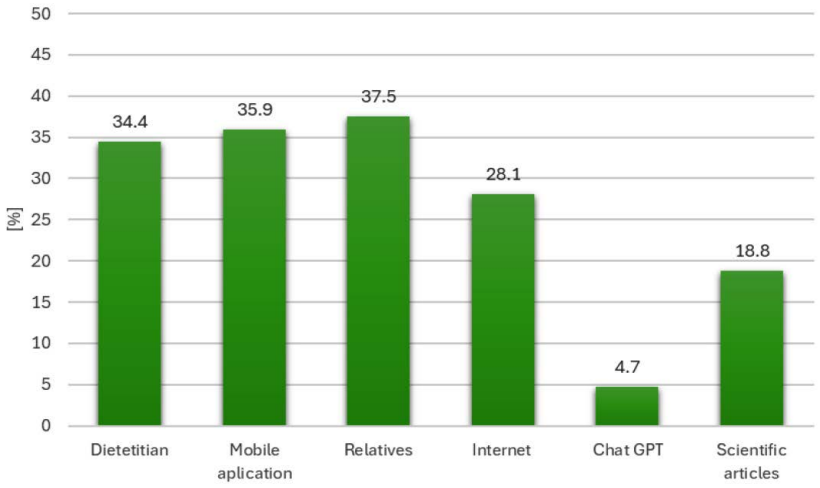

Figure 6. Sources of information about nutrition

Source: own elaboration based on survey results (*N* = 64).

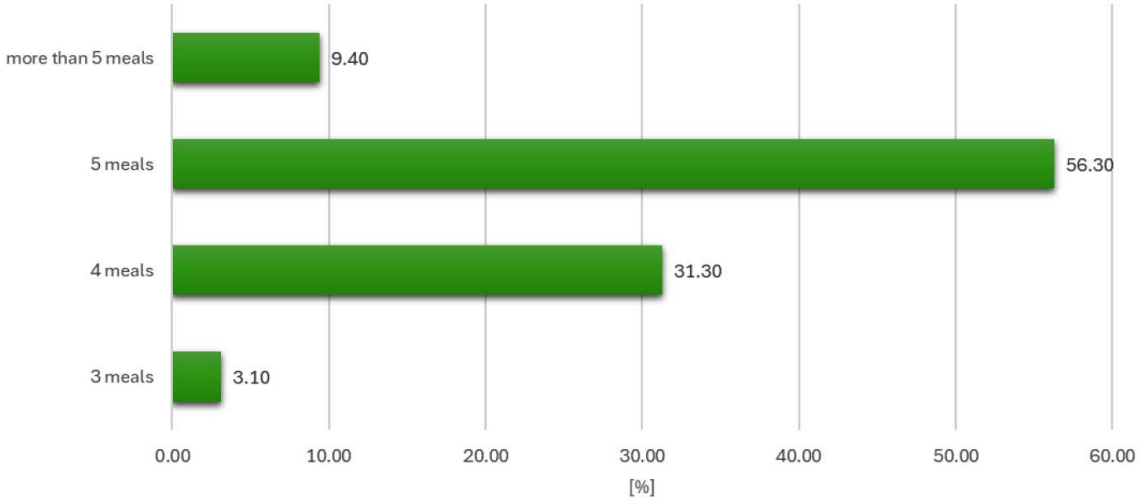

Figure 7. Number of meals consumed per day

Source: own compilation based on survey results (*N* = 64).

None of the surveyed caregivers indicated intervals longer than 4 hours between meals. However, around 30% declared a lack of regular intervals between eating; despite this, the majority of parents - 66% maintain proper intervals between meals. The obtained responses can be considered satisfactory because most responses were in line with recommendations for caregivers of children's nutrition.

A small percentage of the respondents (15.6%) stated that their children do not consume sweet snacks. The remainder declared their children's consumption of such products, including 7.4% who consume them daily and half of the children several times a week. Similar findings were also noted in studies by other authors (Łukasik et al., 2014; Newerli-Guz and Kulwikowska, 2014; Szczepańska et al., 2014). Just under 30% of preschoolers do not consume them more than once a week (Figure 8). Sweet snacks are one of the most popular and liked products by children. They are an integral part of this stage of development, so it is essential not to restrict a child's access to them at all costs. Nonetheless, it is imperative to monitor the dietary intake and portion sizes of intermediate snacks consumed by the child between primary meals (Gębski and Kosicka-Gębska, 2013).

Vitamin D plays a significant role in the functioning of the immune system; it is responsible for bone health, ensures proper growth, and prevents rickets in children. Together with calcium, it is essential for building optimal peak bone mass in adolescence, and in older age, it prevents the development of osteoporosis. Only 39.1% of the respondents answered correctly regarding daily supplementation of vitamin D3 (600-1000 IU) (Figure 9). Additionally, 20.3% revealed the need for more knowledge on this issue, while the rest of the respondents answered incorrectly.

The study results indicate that only slightly over half of the respondents (54.7%) declared feeling sufficiently knowledgeable about nutrition to consciously incorporate appropriate products into their child's diet. One can observe that individuals with a higher education more frequently stated a sense of sufficient knowledge than those with secondary education or currently studying. Unfortunately, 45.3% of the respondents still lack knowledge or certainty regarding nutrition (Figure 10). It is worth noting that over 90% undertook actions aimed at educating their children about healthy eating (Figure 11). The responses regarding parents' sense of knowledge differ from those of the parents in the study conducted by Szczepańska et al. (2014).

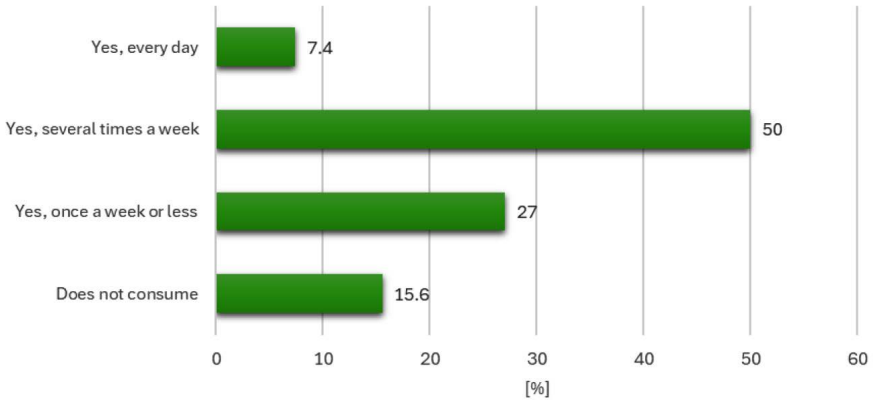

Figure 8. Consumption of sweet snacks

Source: own compilation based on survey results (*N* = 64).

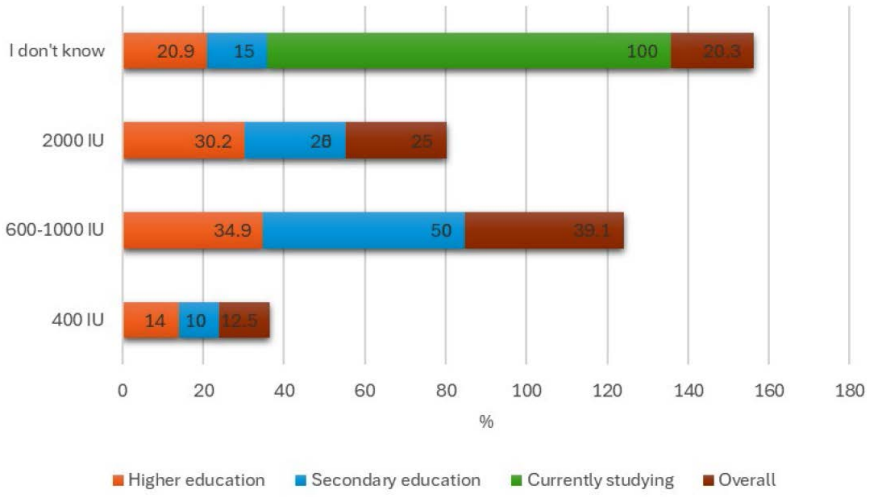

Figure 9. Daily supplementation of vitamin D3 from September to April in children aged 1-10

Source: own compilation based on survey results (*N* = 64).

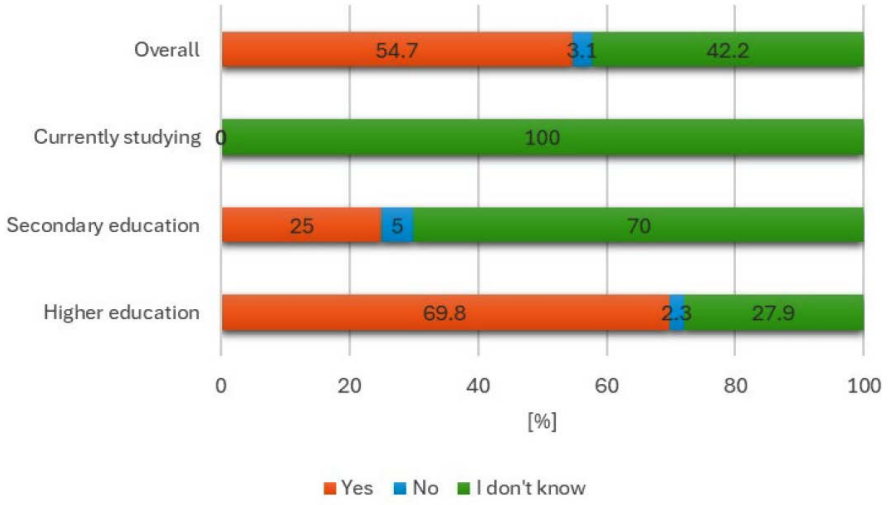

Figure 10. Knowledge about nutrition to incorporate appropriate products into the diet according to education level

Source: own compilation based on survey results (*N* = 64).

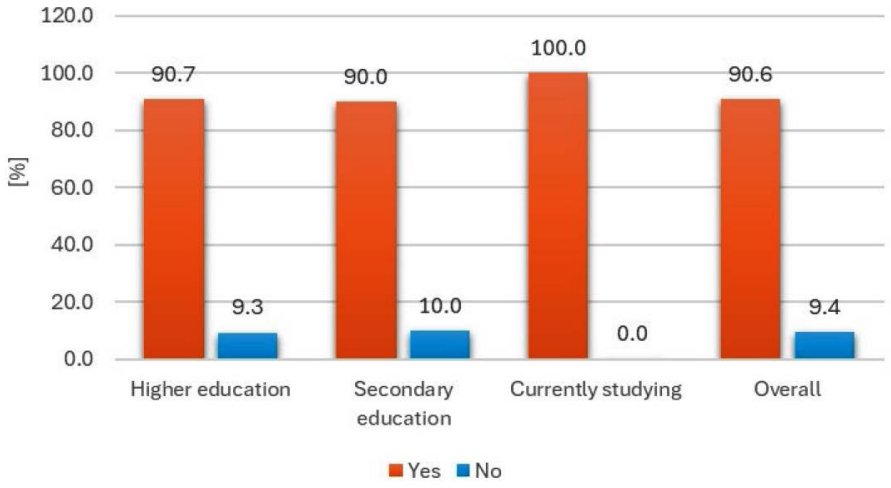

Figure 11. Actions aimed at educating the child about healthy eating

Source: own compilation based on survey results (*N* = 64).

Parents play a crucial role in shaping their children's eating behaviour patterns and nutritional knowledge, particularly during their formative years in kindergarten. Studies show that kindergarten-based nutrition education interventions improve preschoolers' lifestyles and positively change parents' attitudes toward planning their children's diets and eating habits (Hu et al., 2009). Furthermore, parental influence during the preschool period significantly impacts on children's nutrition, emphasising the importance of parental involvement in developing healthy eating habits (Hu et al., 2019).

Understanding parental knowledge, attitudes, and behaviour related to nutrition is essential. Research indicates that parental snacking-related attitudes, behavior patterns, and nutritional expertise significantly influence young children's healthy and unhealthy snacking habits (Gibson et al., 2020). Moreover, parents' knowledge about sugar in beverages has been linked to children's dairy beverage intake, highlighting the importance of parental knowledge in influencing children's dietary choices (Zahid et al., 2017).

While parental knowledge plays a crucial role, studies also show that parents may underestimate certain aspects of their child's nutrition, such as sugar content, which can affect the child's risk of being overweight (Dallacker et al., 2018). Collaborative efforts involving parents in child nutrition programs, such as workshops and training sessions, have been positively received by parents, indicating a willingness to engage in activities that promote healthy eating habits (Eid, 2019).
In conclusion, parental knowledge about child nutrition, attitudes toward healthy eating, and behaviour related to food choices significantly influence children's dietary habits during kindergarten. Educating parents, involving them in nutrition programmes, and raising awareness about healthy eating practices are essential in promoting children's overall health and well-being during their formative years.

5. Conclusions and Recommendations

1. In the examined food portions offered by the catering company, correct energy consumption was observed regarding the recommended norms during the summer, while during spring, autumn, and winter, irregularities resulting from excessive energy supply compared to the recommendations were noted. Additionally, excessive protein intake was observed in the analysed menus compared to the recommended norms for each season.
2. The menus differed in meeting children's needs for vitamins and minerals. Regardless of the season, they provided an excessive amount of vitamin A compared to the recommended norms, while the vitamin C intake exceeded them only during the summer. The calcium content was consistently below the dietary recommendations for this age group throughout the year. Only the iron content remained within the norms regardless of the season.
3. The assessment of preschool menus indicates the necessity of introducing changes to modify their composition, which should include, among other things, incorporating seeds of leguminous plants into the diet and limiting meals containing simple sugars. It is also essential to ensure education on children's nutrition for the facility staff and individuals responsible for serving meals to children. Deviations from the norms of consumption of the analysed food components can damage the functioning of a preschool child's body and in the later stages of their life. Detected irregularities in their diet can be corrected by adjusting the quantities of consumed products or replacing them with others.
4. The obtained results indicate that most of the respondents demonstrated an awareness of the principles of healthy eating, however some needed further education in children's nutrition. It is also concerning that many parents declared a need for more confidence in their knowledge of nutrition, although, at the same time, the majority undertook actions aimed at educating children in this area. This suggests a necessity to increase parents' awareness regarding issues related to proper nutrition for their children.

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Rozporządzenie Ministra Zdrowia z dnia 26 lipca 2016 r. w sprawie grup środków spożywczych przeznaczonych do sprzedaży dzieciom i młodzieży w jednostkach systemu oświaty oraz wymagań, jakie muszą spełniać środki spożywcze stosowane w ramach żywienia zbiorowego dzieci i młodzieży w tych jednostkach (Dz. U. z 2016 r., poz. 1154)

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Ocena wartości energetycznej i odżywczej jadłospisów dostarczanych przez firmę cateringową w wybranym przedszkolu we Wrocławiu oraz świadomość rodziców dotycząca rekomendacji żywieniowych

Streszczenie

Cel: Właściwe żywienie dzieci w wieku przedszkolnym jest jednym z kluczowych elementów wspierających ich prawidłowy rozwój fizyczny, umysłowy, a także sprawność intelektualną. Wraz z rosnącą świadomością dotyczącą roli diety w zapobieganiu chorobom cywilizacyjnym coraz bardziej odczuwalna jest potrzeba szeroko pojętej edukacji i kształtowania zdrowych nawyków żywieniowych od najmłodszych lat. W tej kwestii zarówno rodzice, jak i opiekunowie stają przed niemałym wyzwaniem zapewnienia odpowiedniej oraz zbilansowanej diety, która spełni indywidualne potrzeby żywieniowe ich dzieci. Celem pracy było oszacowanie wartości energetycznej i odżywczej jadłospisów dekadowych dostarczanych przez firmę cateringową w wybranym przedszkolu na terenie Wrocławia. Dodatkowo oceniono świadomość rodziców na temat rekomendacji żywieniowych, wykorzystując autorski kwestionariusz ankiety.

Metodologia: Przeanalizowano czterdzieści planów żywieniowych, korzystając z oprogramowania komputerowego Dieta 6D. Oszacowano wartość energetyczną oraz zawartość składników odżywczych, takich jak: białka, tłuszcze, węglowodany, składniki mineralne (wapń, żelazo) oraz witaminy (A, C) w jadłospisach dekadowych dla każdej z pór roku. W drugiej części badania oceniono świadomość rodziców dotyczącą rekomendacji żywieniowych. W celu pozyskania niezbędnych danych sporządzono autorski kwestionariusz ankiety, który skierowano do rodziców bądź opiekunów dzieci w wieku przedszkolnym.

Wyniki: Analiza jakościowa 10-dniowych racji pokarmowych wykazała, że były one komponowane zgodnie z zasadami zdrowego żywienia z uwzględnieniem urozmaicenia, sezonowości produktów i zróżnicowanych technik przyrządzania potraw. Jadłospisy różniły się od siebie pod względem zaspokojenia zapotrzebowania dzieci na witaminy oraz składniki mineralne. Niezależnie od pory roku zapewniały nadmierną ilość witaminy A w stosunku do zalecanych norm, natomiast podaż witaminy C przekroczyła zalecane normy latem. Zawartość wapnia znajdywała się poniżej obowiązujących zaleceń żywieniowych dla grupy wiekowej od 4 do 6 lat. Jedynie ilość żelaza mieściła się w normach bez względu na porę roku. Z przeprowadzonych badań ankietowych wynika, że rodzice dzieci w wieku przedszkolnym przywiązują dużą wagę do kwestii żywienia w placówce przedszkolnej. W przypadku zdobywania informacji na temat żywienia dzieci w wieku 3-6 lat rodzice najczęściej sięgają po wiedzę swoich bliskich oraz specjalistów, takich jak dietetycy, natomiast rzadziej korzystają z opinii naukowców specjalizujących się w żywieniu dzieci. Niestety tylko 35% rodziców z wyższym wykształceniem posiadało odpowiednią wiedzę na temat właściwej dawki witaminy D w tym wieku.

Implikacje i rekomendacje: Przeprowadzona ocena jadłospisów przedszkolnych wykazała konieczność wprowadzenia zmian dotyczących modyfikacji ich składu, które uwzględnią m.in.: wprowadzenie do diety nasion roślin strączkowych i ograniczenie posiłków zawierających cukry proste. Wiedza i postawy żywieniowe nauczycieli przedszkoli i rodziców odgrywają istotną rolę w kształtowaniu nawyków żywieniowych dzieci. Badania wykazały, że niedostateczna lub nadmierna podaż składników odżywczych, a także wybredne zachowania żywieniowe oraz brak wiedzy na temat żywienia wśród nauczycieli i personelu to częste problemy w przedszkolach. Dlatego niezbędne są interwencje skupiające się na poprawie wiedzy i postaw żywieniowych wśród nauczycieli i rodziców.

Słowa kluczowe: dekadowe plany jadłospisów, ocena wartości odżywczej, żywienie dzieci