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ASSESSMENT OF KNOWLEDGE OF THE BASIC PRINCIPLES OF PROPER NUTRITION AMONG PARENTS OF CHILDREN AGED 6-10

OCENA WIEDZY RODZICÓW DZIECI W WIEKU 6-10 LAT NA TEMAT PODSTAWOWYCH ZASAD PRAWIDŁOWEGO ŻYWIENIA

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Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
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Summary

Background. One of the most important factors in a child's development is balanced diet and the formation of good eating habits.
Material and methods. Parents of children (n=908) aged 6-10 attending primary schools in Poland were surveyed between September 2018 and June 2019. The research tool was a survey questionnaire divided into 4 parts. The first 3 parts dealt with information about the child, while the 4th part was dedicated to parents, and the questions in it assessed parents' knowledge about the correct principles of child nutrition.
Results. Almost half of the respondents rightly claimed that a proper balanced diet for a child should include five or more meals per day. Slightly less than half of the respondents, i.e. 40.5%, stated incorrectly that the child's daily intake of milk or milk products should be one portion. Only 6.4% of the parents correctly considered that the daily consumption of dairy products by the child should be at least three to four portions. The correct answer about the recommended consumption of 5 portions of fruit and vegetables per day was indicated by 12.7% of parents. Almost half of the parents knew that regular physical activity is at the base of the Pyramid of Healthy Food and Lifestyle for Children and Teenagers.
Conclusions. Parents' knowledge of proper nutrition is still insufficient. It is very important that the correct principles of nutrition apply to everyone in the household, and not just to the child in an isolated way.

Keywords: child nutrition, nutrition, parents, knowledge, children

Streszczenie

Wprowadzenie. Jednym z najważniejszych czynników wpływających na rozwój dziecka jest zbilansowana dieta oraz kształtowanie się prawidłowych nawyków żywieniowych.
Materiał i metody. W okresie od września 2018 do czerwca 2019 r. badaniem objęto rodziców dzieci (n=908) w wieku 6-10 lat, uczęszczających do szkół podstawowych w Polsce. Narzędziem badawczym był kwestionariusz ankiety podzielony na 4 części. Pierwsze 3 części dotyczyły informacji o dziecku, natomiast 4-ta część była skierowana do rodziców, a pytania w niej zawarte oceniały wiedzę rodziców na temat prawidłowych zasad żywienia dzieci.
Wyniki. Prawie połowa respondentów słusznie twierdziła, że prawidłowa, zbilansowana dieta dziecka powinna zawierać pięć i więcej posiłków na dobę. Nieco mniej niż połowa ankietowanych, tj. 40,5%, błędnie twierdziła, że codzienne spożycie mleka lub jego przetworów przez dziecko powinno wynosić odpowiednio jedną porcję. Jedynie 6,4% rodziców poprawnie uznało, że codzienne spożycie nabiału przez dziecko powinno wynosić przynajmniej trzy-cztery porcje. Prawidłowa odpowiedź o zalecanym spożyciu 5 porcji warzyw i owoców dziennie została wskazana przez 12,7% rodziców. Niemal połowa rodziców wiedziała, że u podstaw Piramidy Żywienia i Stylu Życia Dzieci i Młodzieży leży regularna aktywność fizyczna.
Wnioski. Wiedza rodziców na temat zasad prawidłowego odżywiania jest wciąż niewystarczająca. Bardzo istotne jest, by prawidłowe zasady żywienia dotyczyły każdego domownika, a nie tylko dziecka w sposób izolowany.

Słowa kluczowe: żywienie dzieci, żywienie, rodzice, wiedza, dzieci

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Introduction

Childhood is the most dynamic stage in human development. One of the most important factors influencing child development is a proper, balanced diet and the formation of correct eating habits. There is increasing evidence that the health status of the adult population depends on a good diet since their early childhood [1]. Sedentary lifestyle and improper diet are among the main causes of excessive body weight [2]. The low level of knowledge about the principles of proper nutrition intensifies dietary errors and fixes inappropriate eating habits [3]. It should be emphasized that eating habits are formed to the greatest extent until the age of 10. Parents' dietary mistakes are, so to speak, "passed on the plate" to the child [4]. In addition, there is still a widespread belief that an obese child "is well nourished" and that he or she "will lose weight with time and spontaneous activity". This stereotype has its adverse health and social consequences in the later stages of child development. It has been shown that overweight children also enter adulthood with co-occurring excess body weight and are significantly more predisposed to earlier onset of clinical complications of obesity [5,6].

To systematize the correct principles of healthy nutrition and health behavior among children, it is recommended to follow the principles classified in the Pyramid of Healthy Nutrition and Lifestyle of Children and Teenagers. Its latest version dates back to 2019 and was developed by the Institute of Food and Nutrition (Poland) under the editorship of Professor Mirosław Jarosz, PhD. It is dedicated to children aged 4-18. The new version of the pyramid puts particular emphasis on the importance of not only proper nutrition activity in the life of a young person but also physical, which should be performed every day for about 60 minutes with moderate intensity [7]. "The Pyramid" also draws attention to other aspects of lifestyle such as proper sleep and rational application of the rules of use of computers, mobile phones and other electronic devices. The above is confirmed by the renaming of the pyramid taking into account the lifestyle of children and teenagers [8]. According to the recommendations of the American Academy of Pediatrics (AAP), daily use of mobile devices, computers or TV should not exceed 2 hours [9,10].

The current nutrition recommendations, which were published in 2020, present the most important nutrition principles in the form of the so-called Healthy Eating Plate. It is dedicated to both adult and child populations. The graphically presented form of the plate indicates the recommended proportions of individual product groups in the whole-day diet. Half of what we eat should be vegetables and fruit in the proportion of 3:1. The other half of the daily diet should consist of low-fat dairy products, whole grain cereals, legumes, fish and nuts. Next to the plate on one graphic representation there are also recommendation categories such as "Eat less", "Eat more" and "Swap", in which the individual product groups are listed [11].

This study is the last in a series of publications that presents the results of an extensive project (the results of which exceed the formal guidelines of a single original paper) involving the assessment of nutritional status, analysis of dietary habits and physical activity levels among children aged 6-10 years attending primary schools in Poland, together with an assessment of the knowledge of their parents about the principles of proper nutrition. This article presents the last aspect of this project, i.e. the assessment of parents' knowledge about the principles of proper nutrition in children.

Material and methods

The research material and methodology are the same as described in the previously published studies by the authors [12-14]. The study was approved by the Bioethics Committee of the Medical University of Silesia in Katowice (no. KNW/0022/ KB1/94/I/18/19). It was also conducted in accordance with the principles of the Declaration of Helsinki. Participation in the study was completely voluntary and anonymous. Parents expressed their willingness to participate in the study in the form of written consent.

The study covered parents of children aged 6-10 years attending primary schools in Poland. The actual research tool was an anonymous self-administered questionnaire, which was distributed to the parents of children during meetings with parents at school by the authors of this study, together with initial instruction on how to fill in the questionnaire. The questionnaire was also completed at these meetings or at home. Parents who wished to fill in the questionnaire at home handed it back to the child's teacher or directly to the pedagogue at school. Participation in the study was completely voluntary and anonymous. The criteria for inclusion in the study were the consent of the headmaster of the educational institution and the size of the institution: at least 150 pupils. In addition, parents expressed their willingness to participate in the study in the form of written consent. The intention of the authors was to distribute questionnaires to at least 2 primary schools located in each voivodship in Poland. A total of 38 schools took part in the study, of which 8 schools were located in the Silesian Voivodeship (due to the proximity to the authors of this study).

The questionnaire was created by the authors of this study and the questions in it were based on the guidelines created by the Institute of Food and Nutrition (2017 edition) included in the study titled: "Principles of nutrition for the Polish population" [15]. The questions in the survey were conventionally divided into 4 parts. Three parts focused on information about the child, i.e. basic anthropometric measurements of children made by parents (body weight and height), basic sociodemographic information of the family (including family structure, parents' level of education, number of people working professionally in the family), children's eating habits and their level of physical activity. The third part of the questionnaire focused on questions about the children's level of physical activity. The last part was dedicated to parents and aimed to represent their knowledge about the basic principles of good nutrition. It consisted of 15 single or multiple choice questions.

This article presents the distribution of responses to questions from this part of the questionnaire. 5,000 questionnaires were distributed between September 2018 and June 2019. The response rate obtained was 20.2%. 1010 questionnaires were received, of which only those questionnaires having its 1st part fully completed were qualified for statistical analysis. Finally, data collected from 908 parents of children with a similar distribution of both sexes were included in the statistical analysis. The intention of the authors was to gather a representative group in terms of socio-demographic characteristics such as age, gender, place of residence in order to best represent the general population. The analysis of obtained results was performed with the use of professional statistical software IBM SPSS Statistics version 25. For the comparative analysis of obtained data the parametric Student's T-Test for independent variables and non-parametric Mann-Whitney and Kruskal-Wallis U tests were used. Correlation analysis was performed using Pearson's *r* and Spearman's *rho* coefficient. In this study, a value $p \leq 0.05$ was considered statistically significant.

Results

Almost half of the respondents (46.7%) declared that a well-balanced diet for a child should include five or more meals per day. Slightly more than 40% of parents (42.2%) indicated that this diet should consist of three meals and an afternoon snack (Figure 1).

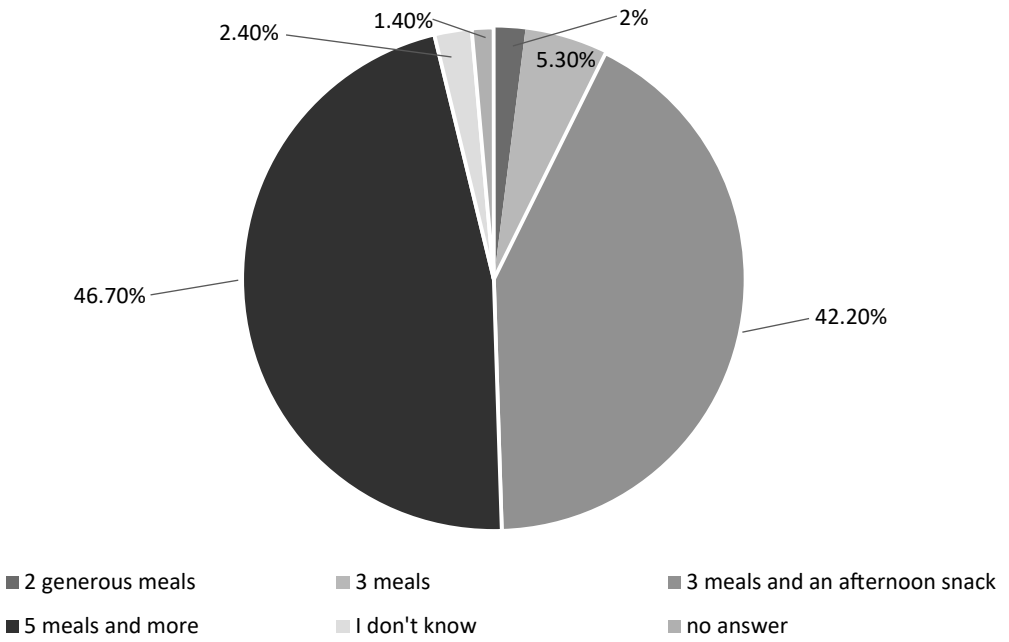

Figure 1. Percentage distribution of answers to the question: "How many meals per day should a child's balanced diet contain?"

The next question concerned the recommended number of servings of milk or milk products (e.g. yoghurt, buttermilk, cheese; without eggs) a child should consume. The majority of the respondents, 40.5% and 27.8% respectively, declared that the daily consumption of milk or milk products should be one or two portions. On the other hand, 12.4% of the respondents indicated that these products do not have to be consumed daily by

children. Only 6.4% of parents thought that the daily consumption of these products by their child should be at least three to four portions (Figure 2).

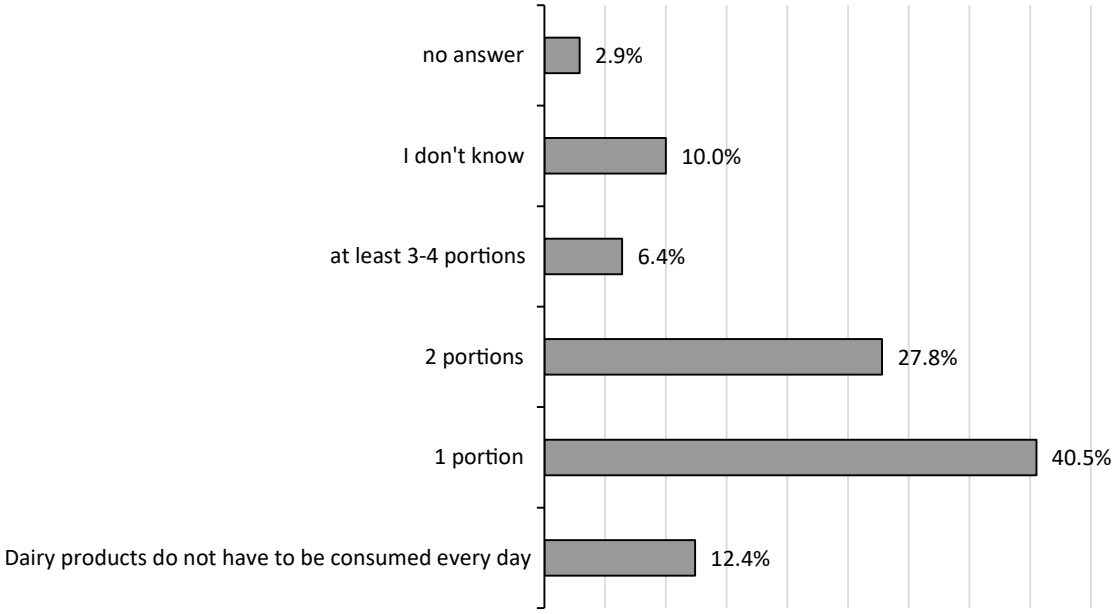

Figure 2. Percentage distribution of responses to the question: "What is the recommended daily intake of milk or milk products (e.g. yoghurt, buttermilk, cheese) by a child?"

The questionnaire also included a question about the recommended frequency of servings of fruit and vegetables per day. According to the results, the vast majority of parents indicated that children should eat only one (37.2% of the respondents) or two to three (39.0% of the respondents) servings of fruit and vegetables every day. The answer about the recommended daily consumption of at least 5 portions of fruit and vegetables was indicated by only 12.7% of parents (Figure 3).

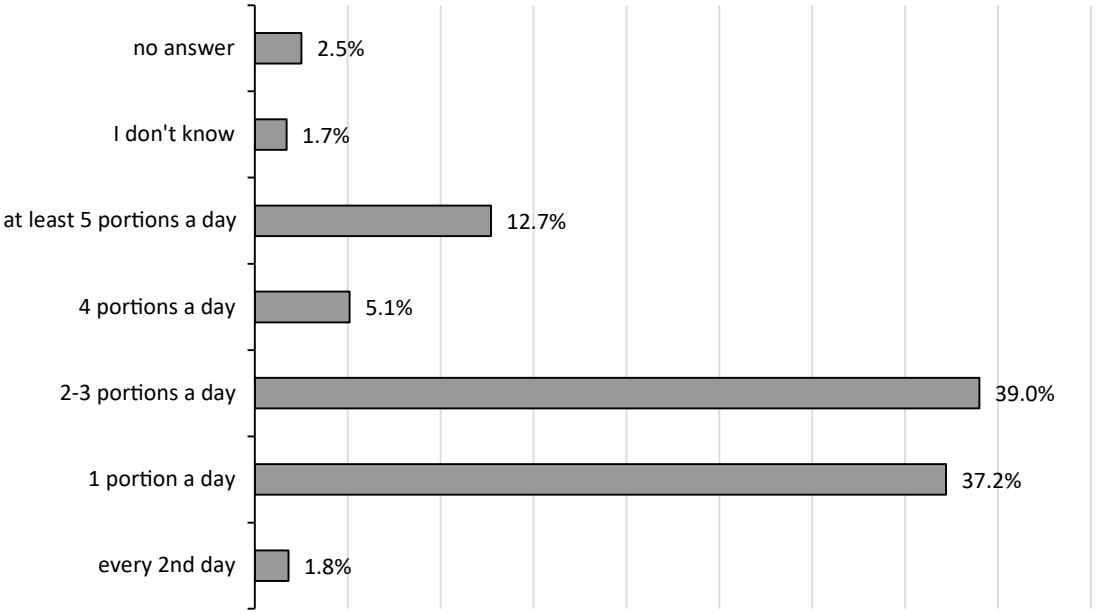

Figure 3. Percentage distribution of answers to the question: "What is the recommended daily intake of fruit and vegetables for a child?"

More than half of the parents (52.9% of the respondents) indicated that one portion of meat-fish-egg products per day was sufficient for their children (Figure 4).

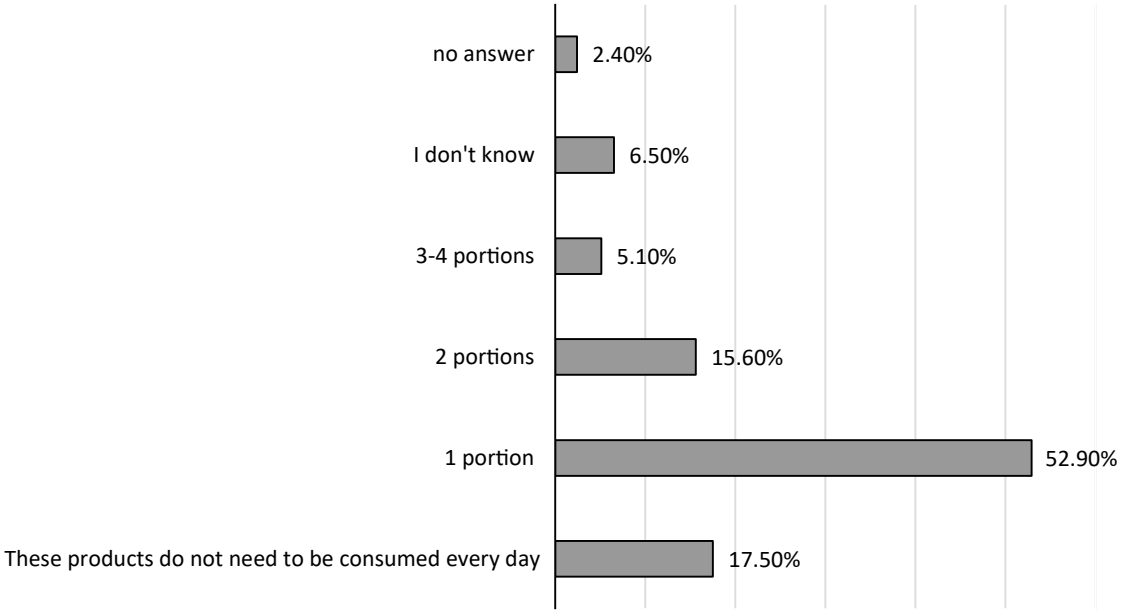

Figure 4. Percentage distribution of answers to the question: "What is the recommended daily intake of servings of products from the group meat-fish-eggs for a child?"

The next question concerned the recommended daily percentage share of carbohydrates to cover the energy requirements of a child's diet. According to the results, on average, one in three parents (32.3% of the respondents) indicated that they did not know the answer to this question. Approximately half of the parents said that the recommended proportion of carbohydrates in the child's diet is 25% to 35% or 36-49%. Only 13.0% of the respondents indicated that the daily carbohydrate intake in the child's diet should be between 50% and 70% (Figure 5).

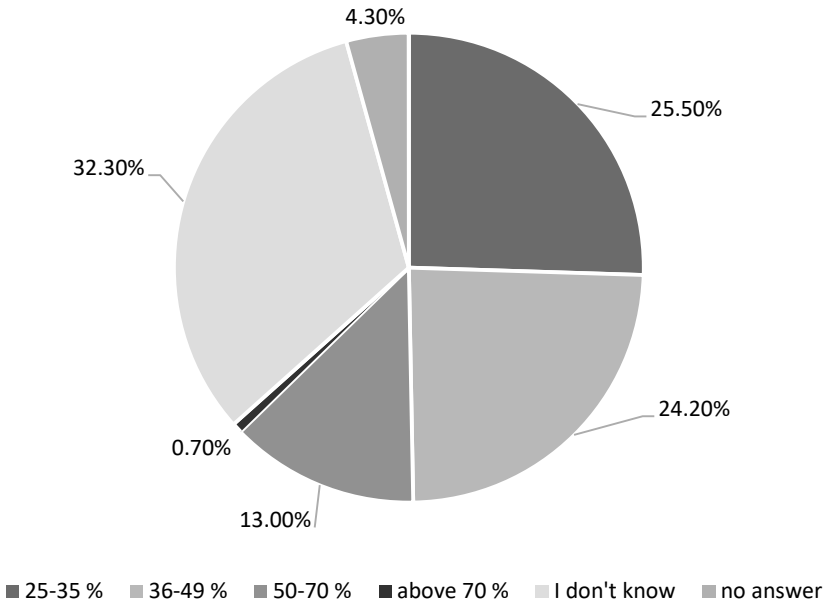

Figure 5. Percentage distribution of answers to the question: "What is the carbohydrates percentage share recommended in a child's daily energy intake?"

Further questions focused on the recommended percentage share of fats and protein for the daily energy requirements of the child's diet. Again, on average one in three parents indicated that they did not know the answer to these questions. 13.1% of the respondents indicated an answer presenting a percentage range of 20% to 35% of fat in the child's daily diet. In turn 18.4% of parents indicated that the minimum recommended percentage of protein in the child's diet is 15% (Figure 6 and 7).

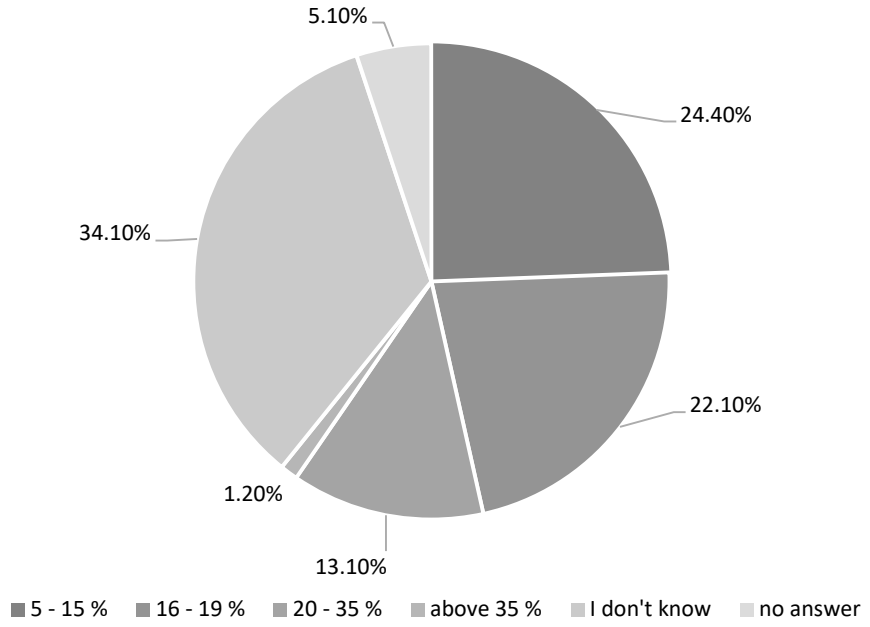

Figure 6. Percentage distribution of answers to the question: "What is the fats percentage share recommended in a child's daily energy intake?"

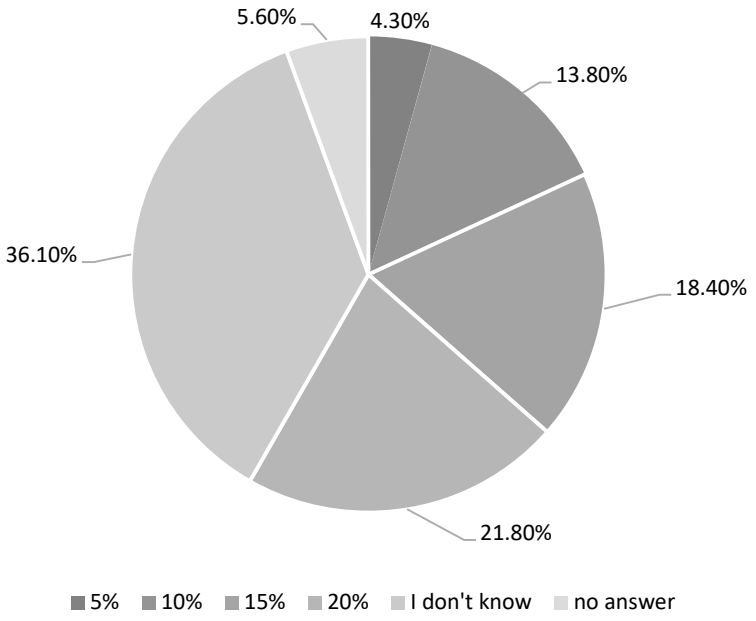

Figure 7. Percentage distribution of responses to the question: "What is the minimum recommended percentage of protein for the daily energy requirements of a child's diet?"

When asked about the main source of animal protein in the child's diet, most parents indicated milk and dairy products (48.0% of the respondents). Slightly fewer respondents marked the answer poultry, eggs and/or fish (Figure 8).

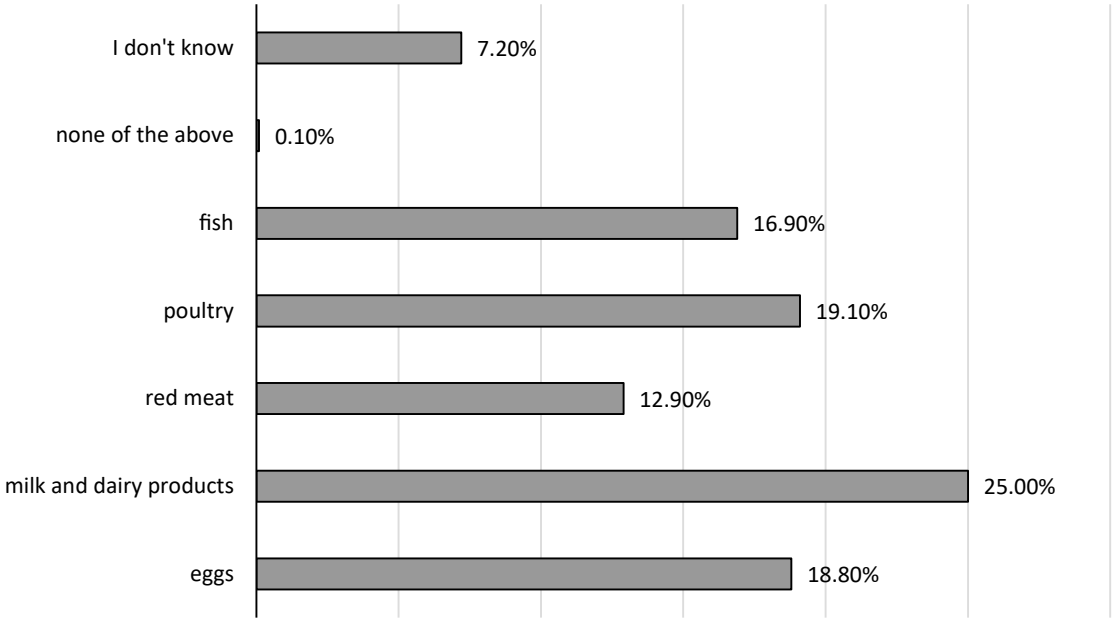

Figure 8. Percentage distribution of responses to the question: "What is the main source of animal protein in your diet?" (You can mark more than one answer)

The questionnaire also included the question: "Which products have a high cholesterol content (above 200 mg)?". Most respondents (30.8% of those surveyed) indicated butter "extra". On average, one in four people said that eggs contained more than 200 mg of cholesterol (24% of the respondents). Interestingly, as many as 38.0% of the respondents admitted that they did not know which products had high cholesterol content (Figure 9).

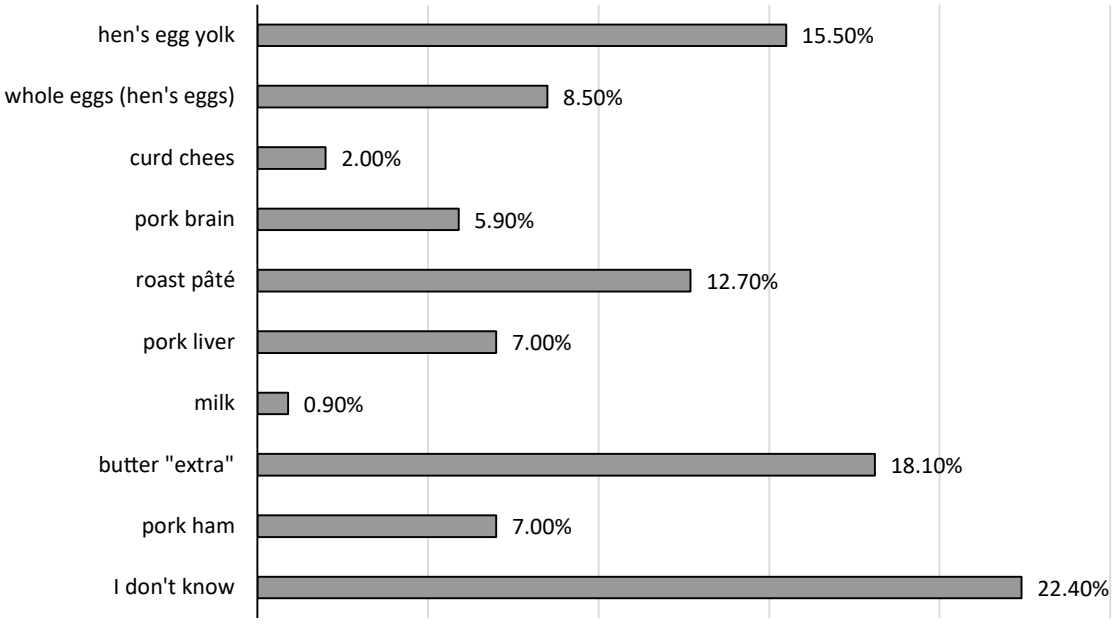

Figure 9. Percentage distribution of answers to the question: "Which products have high cholesterol content (above 200 mg)?" (You can mark more than one answer)

The next question was about the Healthy Eating Pyramid (up-to-date at the time of the survey) and, more specifically, what constitutes its basis. The results show that almost half of the parents (46.6% of the respondents) indicated that regular physical activity is at the base of the Pyramid. A slightly smaller percentage of the respondents (36.9% of the respondents) indicated in turn that vegetables and fruit are at the base of the Pyramid (Figure 10).

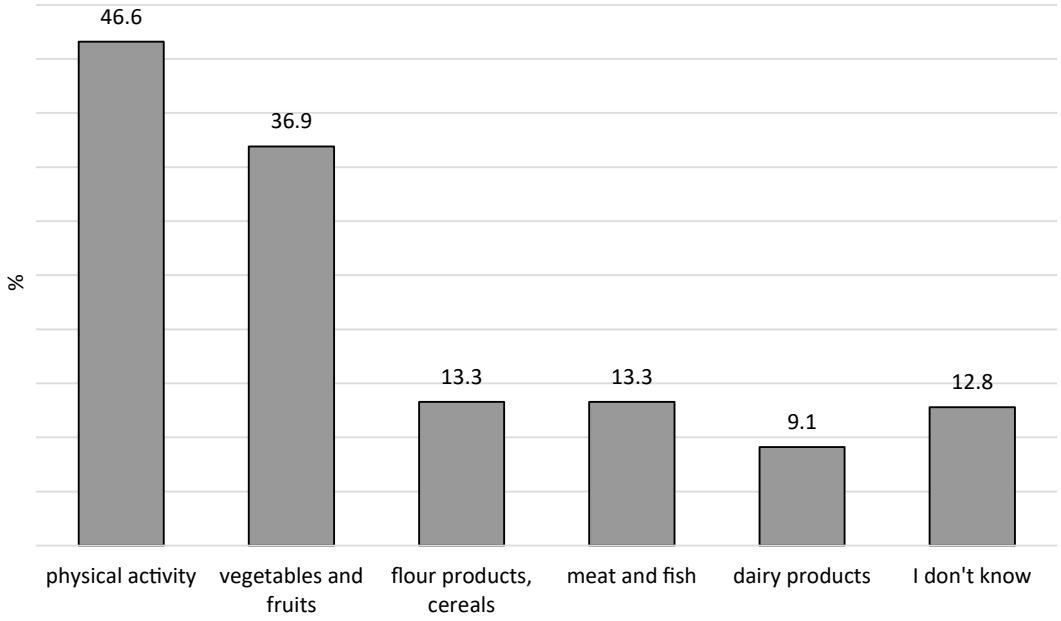

Figure 10. Graphical representation of the respondents' answers to the question: "What is the basis of the Healthy Eating Pyramid?" (You can mark more than one answer)

The questionnaire also asked about the recommended minimum amount of time a child should dedicate to moderate physical activity (walking, dancing, cycling, swimming). Almost half of the parents (47.1% of the respondents) indicated that their child should spend between 30 and 60 minutes per day on moderate physical activity. A slightly smaller percentage of the respondents indicated a response of a minimum of 15 minutes per day (13.0% of the respondents) or more than an hour (19.4% of the respondents). As many as 7.2% of the respondents indicated that they had no knowledge in this area (Figure 11).

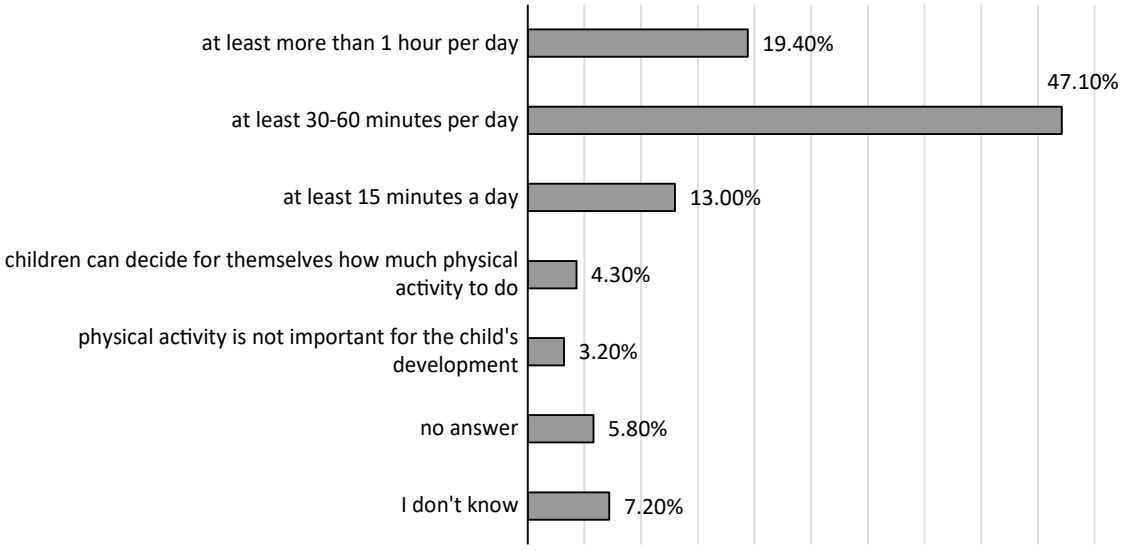

Figure 11. Percentage distribution of answers to the question: "What is the recommended minimum amount of time a child should dedicate to moderate physical activity?"

Further questions were related to the knowledge of the amount of energy supplied to the body by selected food components, i.e. protein, fat and fiber. The data in Table 1 show that the vast majority of the respondents do not know how many kcal is supplied to the body by the consumption of 1 gram of fat, protein and fiber in the diet.

Table 1. Percentage distribution of answers given on the amount of energy supplied to the body after consumption of 1 gram of fat, protein and fiber (values in bold indicate the percentage of correct answers)

kcal	1 gram		
	Fat [%]	Protein [%]	Fiber [%]
2	2.0	3.1	**12.1**
4	4.1	**15.0**	6.7
7	4.6	4.6	2.8
9	**14.3**	4.0	3.0
12	5.3	1.4	1.6
I don't know	60.9	62.4	64.6
No answer	8.9	9.7	9.3

Further analysis focused on the correlation of parents' knowledge scores on healthy eating with factors that may differentiate the level of this variable. These factors included parental overweight/obesity, taking part in joint physical exercise with the child, and the level of parents' education. According to the results overweight/obesity of the parent is not a differentiating factor for the level of parental knowledge on healthy eating. This means that the knowledge of a parent who is overweight or obese about nutrition is comparable to a parent who is not overweight/obese (p=0.48) (Table 2).

Table 2. Mean scores, standard deviations and significance of differences in parents' level of knowledge of nutrition principles according to their struggle with overweight/obesity

	Parents which are overweight/obese (n=193)		Parents with correct body weight (n=633)		*Z*	*p*	*r*
	M	*SD*	*M*	*SD*			
Level of knowledge on nutrition principles	3.01	2.06	3.16	2.16	-0.70	0.485	-0.03

A further correlation showed that joint parent-child physical exercises differentiate the level of parental knowledge on the principles of healthy eating. The results show that parents who engage in joint physical activity with their child have a higher level of knowledge on the principles of healthy eating compared to parents who do not engage in physical activity (p=0.002). The results are also presented graphically (Table 3).

Table 3. Mean scores, standard deviations and significance of differences in parents' level of knowledge about nutrition principles according to taking up joint physical exercise

	Parents undertaking physical exercise with their child (n=324)		Parents who do not undertake physical exercise with their child (n=498)		*Z*	*p*	*r*
	M	*SD*	*M*	*SD*			
Level of knowledge on nutrition principles	3.38	2.13	2.96	2.11	-3.07	0.002	0.13

The study also found that a parent's education (both mother's and father's) was positively correlated with their knowledge of nutrition principles (p=0.001) (Table 4).

Table 4. Correlations of parent's knowledge about nutrition with their level of education

		Parental knowledge about nutrition
Mother's educational level	Spearman's *rho*	0.18
	significance	0.001
	n	818
Father's educational level	Spearman's *rho*	0.14
	significance	0.001
	n	805

For both mother and father, the higher the education, the higher the level of knowledge about nutrition. The strength of the association of mother's education with nutrition knowledge is comparable to the strength of the association of father's education with nutrition knowledge (z=0.83; p>0.05).

Discussion

Adolescence is characterized by rapid changes in the body from the somatic and psychological points of view. During this period, it is particularly important to ensure that the diet contains all the necessary nutrients in a quantitatively and qualitatively balanced form. While in theory this task seems quite simple, in practice, when faced with everyday life, the principles of healthy nutrition can often be treated very superficially. In addition, the assessment of knowledge about the principles of proper nutrition and knowledge about the potential health consequences of not adhering to them, despite its high popularity in the mass media, is, according to the authors of this study, not so often the subject of scientific research. An aspect that the authors of the present study would like to mention is that in 2020 the latest recommendations "Nutrition standards for the Polish population and their application" ("Normy żywienia dla populacji Polski i ich zastosowanie") [16] were published by the Polish National Institute of Public Health (formerly the Polish Food and Nutrition Institute). Due to the fact that our study was conducted before the publication of the latest version of the nutrition standards, the authors of this study used an older study, dated 2017, entitled "Nutrition standards for the Polish population" ("Normy Żywienia dla populacji Polski") [15]. The now updated nutritional standards for most nutrients are in line with the standards developed in 2017. However, a few changes have been made that the authors would like to mention. First, the name of the recommendations has changed. In the latest version, the word "application" has been added due to the addition of new chapters on the application of individual standards. In a way, this is to indicate the more practical aspect of the latest version of the nutrition standards. In addition, compared to the 2017 standards, the recommendations for the consumption of additional energy for women in each trimester of pregnancy have been modified in the latest recommendations. Special attention has also been paid to the need for omega-3 unsaturated fatty acids, to which a separate chapter has been devoted. It includes recommendations for fish consumption, taking into account their content of omega-3 unsaturated fatty acids and the presence of potential contaminants. Moreover, reference intake ranges, RI (Reference Intakes), have been defined for fats and carbohydrates, whereas previously these were standards expressed in grams/person/day corresponding to the ranges of percent energy from fat set by international expert bodies [16].

Our survey is one of the few that cover such a large group of respondents from all over Poland and take up the subject of the principles of proper nutrition. An additional advantage of this study is the collection of research data using the so-called indirect interview method. The questionnaire containing questions concerning the child was addressed to its parents so that the answers reflected the reality in the home environment as much as possible. Besides, eating habits are mainly formed up to the age of 10. This is the time when children imitate the eating habits of their parents, since outside the school and educational environment they eat mainly at home. Therefore, adequate parental knowledge about the principles of proper nutrition of a child is crucial to ensure its proper development and to teach it proper eating habits.

In a study by Niewierska et al. which was conducted among secondary school students, it was found that 91% and 84% of girls and boys respectively knew correctly that 3-5 meals a day should be eaten [17]. In the study by Cieślik et al. the vast majority of the respondents also indicated the correct answer concerning the number of meals consumed per day [18]. However, in the study conducted by Wanat et al. the correct number of meals per day was given by only 1/3 of the respondents [19]. In our study, the answers to this question are quite satisfactory. The correct answer was obtained from about half of the respondents who marked the answer "5 and more meals". Adequate distribution of energy intake over time determines relatively stable glycaemia, which gives a sense of satiety and its even consumption in cells. However, according to some sources, the answer

"3 meals and an afternoon snack", which gives a total of 4 meals per day, could also be taken into account. This answer was given by about 40% of the respondents.

Another important issue that the authors would like to mention in the discussion is the frequency of fruit and vegetable consumption by children. In our study, it is very worrying that only less than 13% of parents marked the correct answer on the frequency of consumption of this type of products per day. Most respondents ticked the answer indicating the consumption of 1 portion of fruit/vegetables per day or 2-3 portions per day. The distribution of these answers obtained in our study is surprising and worrying, all the more so because the official recommendations on the frequency of consumption of fruit and vegetables have been unchanged for a long time and clearly indicate 5 portions of these products daily. These products are also on the widest level of the Pyramid of Healthy Food and Lifestyle of Children and Teenagers and constitute half of the Healthy Eating Plate. The study by Seń et al. [20] conducted among several hundred students of Wroclaw universities showed that the respondents are aware of the fact that they do not consume enough vegetables and fruit. Only 34-63% of the respondents admitted to daily consumption of 1-3 portions of vegetables/fruit. Additionally, the study showed that students are aware that they also consume too little of other valuable foods such as whole grain products and fish [20]. In our study from the same project presenting the analysis of children's eating habits, it was shown that more than half of the respondents (55.1% of children) eat fruit and vegetables every day [13]. Rucińska et al. [21] showed similar results in this respect. In this study, 54% of overweight 8-year-olds admitted to daily fruit consumption. Vegetables were also consumed daily by the majority of the respondents, however as many as 14.6% of the respondents stated that they never consumed these products [21]. A study by Harton et al. assessed the quantitative intake of fruit and vegetables by preschool children. The results show that the studied children consumed in total about 2 times more fruits than vegetables. Additionally, a decreasing trend in vegetable consumption with age was shown (p=0.0020). On the other hand, almost 9/10 children did not consume enough vegetables per day and one in three children consumed too little fruit per day. The study also showed that the frequency of fruit and vegetable consumption by children is determined by the parents' consumption of these products [22]. This is very valuable information as it indicates a direct link between the dietary habits of parents and their children at this youngest age. Moreover, taking into account the very poor results obtained in our study concerning parents' knowledge on the frequency of fruit and vegetable consumption, it can be concluded that the consumption of these products is unconsciously too low.

Fat is a source of fatty acids, including essential fatty acids (EFAs) of the omega-6 (n-6) and omega-3 (n-3) family, which must be supplied with food. Fatty acids account for up to 95% of fat and it is these fatty acids that determine their physiological role [16]. Omega-3 fatty acids play an important role in the normal development and maturation of the nervous system [23]. Polyunsaturated fatty acids, especially docosahexaenoic acid (DHA) are also necessary for optimal functioning of the organ of vision, e.g. retinal maturation. Its most valuable source is fish, the consumption of which should be at the level of 2 portions of sea fish per week [16].

There is still no clear consensus on the norms of cholesterol intake. It is believed that the endogenous synthesis of its component (in the liver and intestines) at the level of 60-80% of the total amount completely covers the demand of the organism [24]. In addition, the results of meta-analyses on the association between the intake of cholesterol-rich foods (mainly eggs) and parameters of lipid metabolism (in particular on LDL-cholesterol levels) are inconclusive. Based on the analysis of Vincent et al. it appears that after an increased cholesterol intake of 100 mg/day an increase in LDL-C of 2.7; 3.6; 4.6 and 5.5 mg/dl can be expected in people with baseline levels of this lipid of 100, 125, 150 and 175 mg/dl, respectively [25]. Another group of researchers, in a meta-analysis of 28 randomized clinical trials, assessed the effect of egg consumption, compared with non-eating of eggs, on TC, LDL-C and HDL-C concentrations. Meta-regression analysis showed that the number of eggs consumed had no significant effect on total cholesterol and LDL-C [22,26]. In 2019, a meta-analysis of 6 prospective studies in the US population was published showing the relationship of the incidence of cardiovascular events, detailing stroke and total deaths and the amount of cholesterol consumed and the amount of eggs consumed. The analysis showed a positive association of the events studied with an increase in cholesterol intake by each additional 300 mg/day and by each additional half egg. For higher cholesterol intake (by each 300 mg/day) there was a 17% increase in the incidence of cardiovascular episodes over a follow-up period of 17.5 years, and for higher egg intake (by each half egg) this incidence increased by 6%. It was also shown that each additional intake of cholesterol was significantly associated with the incidence of stroke by 26%. More dietary cholesterol also significantly increased the risk of death by 18%. As for egg consumption, each half of an egg increased the risk of death by 8% [27]. The opposite results compared to the above analysis were documented in the data analysis of the prospective American NHANES (National Health and Nutrition Examination Surveys) study. The results show that there was no significant statistical association between egg consumption and total deaths or deaths from coronary heart disease. However, an inverse significant relationship was noticed with egg consumption

[28]. The ambiguous results of studies on the amount of recommended cholesterol intake mean that the recommendations of official American and European societies regarding the upper limit of cholesterol intake are ambiguous and show great caution in this respect [29,30]. The current recommendations of the Polish Diabetes Association advise a cholesterol intake of <300 mg/person/day, and in the case of coexisting lipid disorders, the recommended amount is less than 200 mg/ person/day [31].

Quoting the above mentioned studies, according to the authors of this study, is to facilitate the analysis of questions about products rich in high content of cholesterol and subsequent questions. According to the results only less than a quarter of the respondents marked that a chicken egg contains a high amount of cholesterol (over 200 mg). Even less respondents marked other products rich in cholesterol such as butter "extra", pork brain, pork liver and baked paté. Despite the seemingly quite popular topic of the importance of dietary cholesterol and its possible influence on cardiovascular events and participation in the co-creation of atherosclerotic plaques (mainly LDL cholesterol), knowledge about its content in specific products is low.

From a physiological point of view, dietary fat is primarily a source of the energy required to ensure proper development and maintenance of vital body functions. One gram of fat provides about 9 kcal, which is more than twice as much as the same amount of protein or carbohydrates. In a study by Niewierska, only 18% responded that fats were the most energetic nutrient [17]. In the study by Wojtaś et al. [32] conducted among Warsaw secondary school students, a much higher number of correct answers to this question was obtained from almost 1/3 of the respondents. These students also have less knowledge about the recommended frequency of marine fish consumption [32] than the participants in the study by Niewierska et al. [17]. In our study, the question was constructed directly asking for the amount of kcal supplied by consuming 1 gram of fat, but a much smaller percentage of the respondents knew the correct answer, i.e. only 14%. This low rate of correct answers may be due to the difficulty of the question itself as well as its construction. By asking a question similar to the one in the study by Niewierska et al. [17] (about the most energetic nutrient), it can be assumed that a higher response rate is expected. It is also worth looking at Table 1. and noting the number of "I don't know" answers marked for questions about the amount of energy provided by consuming 1 g of particular nutrients. This answer was chosen by far more than half of the parents when asked about the calorific value of each nutrient. According to the authors, questions in this area were not easy. It would be interesting to ask this question to a group of respondents with medical or dietetic training and to assess the percentage of correct answers obtained. In spite of this, given the continuing interest of consumers in the amount of calories consumed in individual products and the obligation of the food manufacturer to provide information on the calorie content of a given product, the information contained in these questions is valuable.

Moreover, a study assessing the dietary knowledge of child nutrition among kindergarten staff was of interest. The research tool was an anonymous questionnaire, which was distributed to teachers/educators of children, teacher's aides, cooks, accountants and administrative and technical staff. According to the results, only those directly preparing meals for kindergarten children gained knowledge about child nutrition from specialist press. The respondents confirmed the correct application of the principles of proper nutrition of children in the center where they were employed. The group of persons directly involved in the preparation of meals and deciding on the supply of kindergarten canteen showed the highest level of knowledge in this field. It was also shown that in the group of teachers and teaching assistants, there is ignorance of the relationship between a proper diet for children and obesity, and the possibility of developing obesity complications in adult life [33].

It is also very important to note positive correlations between the level of parental education and greater knowledge of nutrition. This may indicate greater awareness of nutrition and more conscious inclusion of specific products in the child's diet. The results of the study by Szczepańska et al. also confirm the above correlations [34].

The most recent World Health Organization recommendations concerning physical activity among children mention moderate physical activity (MPVA) of about 60 minutes daily [35]. Invariably, both the current Pyramid of Healthy Food and Lifestyle for Children and Teenagers and its previous version place regular physical activity as the basis of the pyramid. However, despite this fact, in our study less than half of the respondents knew the answer to the question of what constitutes the basis of the Pyramid. In a study by Ponczek et al. 57% of the participating students knew that physical activity is the basis of the healthy eating pyramid [36]. Our study conducted within the framework of this publication series shows that the largest group of girls and boys (aged 6-10 years), constituting approximately 35-50% of the respondents undertook moderate physical activity less than recommended i.e. 3-5 hours per week. In addition, there were no statistically significant differences between the nutritional status and the amount of time spent on physical activity of both girls and boys [14]. According to the Niewierska et al. study, boys were more likely to regularly participate in physical education classes than girls (78 vs. 39%) and to be active outside school (92 vs. 67%) [17].

Conclusions

Our survey assessing the knowledge of parents of primary school pupils about proper nutrition is one of the few surveys with such a wide range of respondents. It shows that parents' knowledge on this topic is insufficient. The fact is that some of the questions in the survey were not easy to answer. The parents' lack of knowledge about the basic principles of nutrition may influence the development and maintenance of bad eating habits and dietetic mistakes observed both among parents and their children. According to the results obtained, it can be concluded that dietetic errors observed in children often result from parents' nutritional unawareness. Parents should be the greatest authority and role models for early school-age children. Consequently, it is crucial that the correct dietary principles apply to everyone living in the household, and not just to the child in isolation. Nowadays, as a result of the increasing pace of life and the tendency for adults to work longer hours per day, there is a particular need not to forget about good nutrition, especially among the pediatric population. According to the authors, there is a great need to prepare educational materials that are structured in a very simple and concise way and are easily accessible to parents (e.g. in mobile phone applications, TV and radio commercials).

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