Evaluation of the use of dietary supplements among first-grade primary school children from Poland in the context of the socioeconomic status of the family and children's health status

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Summary

Taking dietary supplements without medical indications becomes frequent among children. The main aim of this study was to evaluate the prevalence of dietary supplementation among children attending first grade of primary school (7.6 ± 0.6 years old) along with the impact of health status and socioeconomic factors. The study included a representative group of children from the Kuyavian-Pomeranian Voivodeship, Poland. Data were obtained using a questionnaire completed by parents (n = 2371), obtaining 2258 complete surveys from 42 primary schools. Supplementation was observed among 32.4 % of children (n = 732; 365 boys, 367 girls), regardless of age and gender. Statistical analysis was made using Chi-square test with Yates correction and odds ratios were calculated. Prevailed the use of complex products, as 45.5 % took multivitamin/mineral supplements and 28.2 % polyunsaturated fatty acids. The odds ratio (OR) of giving supplements to children was significantly higher (OR = 1.72) among children with a chronic disease. It was significantly lower among parents with a low level of education (OR = 0.47 for mother and OR = 0.52 for father). Taking dietary supplements was found common among primary school children. The reasons for administering dietary supplements were mainly the child's state of health and the level of parents' education.

Keywords

school-aged children; dietary supplement; socioeconomic status; health status; level of education

Use of vitamin, mineral, herbal and other dietary supplements is widespread in various adult populations and has a tendency to increase [1, 2]. Children, as a sensitive subpopulation, should consume dietary supplements with caution due to susceptibility to an excessive, suboptimal or deficient intake [3]. Analysis of the nutritional value of school children's diets in Poland showed a low intake of some nutrients, including dietary fibre, polyunsaturated fatty acids, vitamin D, vitamin C, B-group vitamins, calcium, iron, zinc, magnesium and copper [4], which may indicate the legitimacy of the use of supplements. In Poland, in accordance with the act on food and nutrition safety, dietary supplement is a food product the aim of which is to enrich the normal diet. It is a concentrated source of vitamins or minerals, or other substances, with a nutritional or other physiological effect. Supplements are available in various forms, namely, capsules, tablets, dragees, sachets of powder, drop dispensing bottles and other similar forms of liquids and powders. In the light of pharmaceutical law, dietary supplements do not have properties of a medical product [5]. This

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definition is in line with European Union regulations [6].

Dietary supplements can be divided into subgroups, depending on composition. European Union commission categorization of food supplements distinguished following subgroups: vitamins, minerals, amino-acids, enzymes, prebiotics and probiotics, essential fatty acids, botanicals and botanical extracts, other substances like coenzyme Q10, lutein and carnitine [7]. Also, a division according to application can be used, e.g. supporting immune system, digestive system, for athletes or anti-aging. Based on current knowledge, the need for additional diet supplementation is assigned in specific cases, e.g. for older people who consume low-calorie diet, pregnant women, or people implementing dietary restrictions or elimination of some nutrients [8]. These recommendations do not include children but, considering the risk of vitamin D deficiency in breastfed infants, official European and Polish recommendations state a need of vitamin D intake at a dose of 10 μg per day even from the first day of life [9, 10]. Currently in Poland, a recommended vitamin D supplementation for children aged 1–10 years is 600–1 000 IU/day, depending on body weight and vitamin D intake from the diet [11]. Other diet components, which are commonly deficient in children and need daily supplementation, are long-chain omega-3 fatty acids, namely, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). According to Food and Agriculture Organization of the United Nations (FAO), children aged 6–10 years should consume 200–250 μg of EPA + DHA daily from food products. However, if they do not get the recommended amount, a supplement should be implemented [12]. European Food Safety Authority states that the recommended dose of these fatty acids is 250 μg per day for children aged 2–18 [13]. Routine use of other dietary supplements is not recommended. Special attention is drawn to the excessive consumption of dietary supplements other than vitamin D and EPA + DHA, which can cause adverse health effects [14, 15]. Moreover, supplements are frequently taken without informing health care providers, thus their dosage is not properly controlled [3].

Various studies demonstrated that socioeconomic status (SES) of a family is strongly associated with health status of its members [16, 17]. Associations between vitamin supplements use, education level and SES indicate a possible effect on healthy behaviours, like functional food consumption (e.g. probiotics defined as living microorganisms that can confer a health benefit, fatty fish, fermented dairy products) [18]. Among younger children, usually parents decide whether they use dietary supplements or not. Parent education, in the context of SES, is a parameter that presents a positive correlation with the intake of multivitamin-multimineral (MVM) products, while family income is less relevant [19, 20]. Moreover, frequently women with higher education consume larger quantities of various food supplements [21]. This may have a direct impact on child dietary supplements consumption, due to a vast influence of maternal diet on child's eating habits [22, 23].

The main aim of this study was to evaluate diet supplementation (including supplements and medicines) among children attending first grade of primary school (aged 6–9 years) along with the impact of health status and socioeconomic factors, like parent education and household income. Validity of supplements consumption and possible health effects were not assessed.

MATERIALS AND METHODS

Study group

The research allowed determining the scale of supplements use among children who were starting education in primary schools (n = 42). The study included a representative group (n = 2258) of children attending the first grade (mean age 7.6 ± 0.6 years old), from the Kuyavian-Pomeranian Voivodeship, a province located in the north-central part of Poland. Study data were obtained using a questionnaire completed by parents of the examined children within the Voivodeship program to prevent malnutrition, overweight and obesity in children from primary schools, grades 1–3, which lasted for three years (2013–2015). The size of the studied population included 20 075 children from the Kuyavian-Pomeranian Voivodeship, and the data source was the Local Data Bank of the Statistical Office. In subsequent years 1 500, 1 000 and 500 children were examined. In order to select a representative for the whole province study, the area was divided into three sub-regions (based on the province largest cities) and next, for each of the sub-regions six municipalities were selected for participation in the study (3 rural and 3 urban-rural) and 5 largest cities. The selection of the study group was random and all students could take part in the study.

Applied questionnaire

In the first part of the questionnaire, questions were focusing on socio-economic status of

the family including parent education, place of residence, household type and poverty risk indicator (*IZU*; in Polish Indeks zagrożenia ubóstwem), also child's health status and occurrence of chronic diseases (e.g. asthma, diabetes, celiac disease, hypertension or obesity). The second part of the survey contained questions concerning diet supplementation, such as trade name of the medicine/supplement, its form (tablets/capsules; syrup/liquid; jelly; powder), frequency (three times a day, twice a day, once a day, 3–4 times a week, two times a week and less often) and duration of use, dosage and by whose recommendation it was given. On the list of used preparations were also medicines prescribed by the general practitioner due to the existing disease, not for enhancing child's diet (e.g. asthma, allergy, diabetes, urinary or thyroid diseases, infections). These medicines were identified and excluded from further analysis. Based on the given names of formulas used, a list was prepared. The list of used formulas was divided into subgroups of formulas being a source of vitamins, minerals, polyunsaturated fatty acids (PUFA), plant compounds or probiotics. Single-component products were qualified as minerals (magnesium, iron, calcium), vitamin D, vitamin C, fish liver oil, as well as complex products, like MVM supplements. In some cases, when only scarce information was given, like vitamin C ($n = 14$), multivitamin ($n = 8$), magnesium ($n = 4$) or vitamin B6 ($n = 1$), without specifically defining the product trade name, those were qualified to a group according to the composition but without indicating the name.

Statistical analysis

Statistical analyses were performed at the 0.05 significance level ($p \leq 0.05$). Evaluation of the relationship between the use of supplements and quality features (child's health status, socioeconomic factors – place of residence, parent education level, *IZU*, household type), was made using Pearson chi-squared test or Pearson chi-squared test with Yates correction ($p \leq 0.05$). The analysis of logistic regression was used to assess the impact of socioeconomic factors and health status of children on the use of dietary supplements.

Odds ratio (*OR*) was calculated for taking supplements depending on:

1. child's health status according to parents' assessment, accepting as a reference group (REF) children with very good health (*OR* = 1.00),
2. occurrence of a chronic disease (REF: no disease),
3. place of residence (REF: city 50 000–100 000 residents),
4. mother's and father's level of education (REF: higher education),
5. poverty risk indicator (*IZU*, REF: low index),
6. household type (REF: occupational).

Statistical analysis was performed using Statistica (version 13.1; StatSoft, Tulsa, Oklahoma, USA).

RESULTS

Survey data were collected from 2 371 children, provided by their parents. In 113 (4.7 %) surveys, respondents provided no information about supplement use (empty space left) and, therefore, these surveys were excluded from the analysis. A number of 2 258 complete surveys were obtained. In general, supplementation was observed among 732 children (32.4 %) attending the first grade of primary school. Taking two supplements

Tab. 1. Dietary supplements taken by children.

Supplement type	Children taking 1 supplement		Children taking 2 or more supplements	
	[%]	*n*	[%]	*n*
Multivitamin/mineral	45.5	300	22.8	34
Polyunsaturated fatty acids	28.2	186	45.6	68
Vitamin C	9.6	63	12.8	19
Plant compounds	9.0	59	8.7	13
Vitamin D	3.3	22	2.0	3
Other single-component products (magnesium, iron, calcium)	2.7	18	4.7	7
Probiotics	0.5	3	1.3	2
Other	1.2	8	2.0	3
Total	100	659	100	149

n – number of respondents.

was reported by 149 children (20.3 %). No difference in diet supplementation was found between boys (32.9 %) and girls (31.9 %) or for child's age. Information concerning the use of one supplement along with its trade name was obtained from 659 respondents (90.0 %).

Among children using one supplement (according to composition criterion) prevailed the use of complex products, as 45.5 % took MVM and 28.2 % PUFA supplements (Tab. 1). Single-component products, like magnesium, iron or calcium, were consumed less frequently, each of them accounted for less than 1.5 %. Different supplements used only by one or two children were defined as "other" (e.g. bee's milk) and constituted 1.2 %. The same calculations were made for children taking two or more supplements (Tab. 1), except that the "other" group concerned supplements used by only one child.

The most common forms of the taken specimens were tablets/capsules (34.2 %), jelly (30.9 %) and syrup/liquid (28.0 %). Only 6.9 % chose powdered formulas that should be dissolved in water before consumption.

Used formulations differed in dose size mainly measured in pieces (e.g. one tablet) or volume measure (e.g. 5 ml). Sometimes doses were defined as "one drop", "0.5 tablet" and were categorized as other (Tab. 2). In terms of frequency of use, 80.3 % of children took supplements once a day, 16.1 % twice a day and 1.8 % three times a day. Only 1.2 % of children took dietary supplements 3–4 times a week and 0.6 % twice a week or less frequently.

Among children taking one dietary supplement, parents administered PUFA once a day in one dose (according to the instructions for use), usually about 1 g of EPA + DHA (5 ml or 2 capsules). Only 5.0 % of children (n = 16) used PUFA twice a day and, among them, four children were given a dose of 10 ml (about 2 g PUFA) on the basis of physician's recommendation.

All children who took more than one dietary supplement consumed the recommended dose of PUFA. Only two children took PUFA supplements more often than once a day in a 10 ml dose, but these were quantities recommended by the physician. Among children taking MVM supplements 90.0 % took them once a day, 8.0 % twice a day and 2.0 % several times a week (twice or 3–4 times a week). The majority of children (92.0 %) took a single dose and only 4.0 % took two doses of MVM.

Information regarding from whose recommendation children took different supplements was obtained only from 81.4 % of respondents. Most frequently (67.3 %), parents decided whether the child should take supplements and only 29.0 % children took supplements prescribed by a physician. Marginal importance for the use of supplements had the pharmacist (1.7 %) and a joint decision of parents and a physician was not frequent (2.0 %). There were no children in the study group who used nutritional supplementation recommended by a dietician.

Effects of health and socioeconomic status were also assessed (Tab. 3). Parents' education level strongly correlated with taking supplementation ($p < 0.001$), as did also incidence of a chronic disease ($p < 0.001$). Place of residence was at the limit of statistical significance ($p = 0.05$) showing that, most commonly, supplements were taken by children living in middle-sized towns (38.8 %) and villages (33.3 %). Household type had also a strong influence ($p = 0.02$) on the supplements use as, most frequently, supplements were taken by children living in an occupational (33.6 %) and pension (30.0 %) households.

Odds ratio (*OR*) for using supplements by children depending on health and socioeconomic status was also determined (Tab. 4). *OR* of giving supplements to children was significantly higher (*OR* = 1.72; 95% confidence interval (95%*CI*): 1.33–2.20; $p < 0.001$) among children with a chronic disease, while subjective assessment of children's health according to the parents' opinion did not affect the use of supplements ($p > 0.05$). *OR* of giving supplements by parents with a basic/vocational education was significantly lower ($p < 0.001$) compared to parents with higher level of education and was 0.52 (95%*CI*: 0.41–0.66) and 0.47 (95%*CI*: 0.37–0.60) for fathers and mothers, respectively. Moreover, in case of mother's education level, even secondary education compared to higher education was associated with a 34% lower supplements use among chil-

Tab. 2. Doses of the taken dietary supplements.

Dose type	Children taking at least 1 supplement	
	[%]	n
One piece	50.4	314
Two pieces	7.9	49
2.5 ml	4.0	25
5 ml	27.2	170
10 ml	6.7	42
Other	3.8	24
Total	100	624

n – number of respondents.

dren (OR = 0.66, 95%CI: 0.41–0.66, $p < 0.001$). Low level of father's and mother's education reduced the chance of giving children supplements by 48.0 % and 53.0 %, respectively, compared to parents with higher education. Significantly lower OR of giving supplements to children was noticed among non-profit households (OR = 0.59, 95%CI: 0.39–0.89, p = 0.01), families living in large cities (OR = 0.73, 95%CI: 0.53–0.99, p = 0.04) and small towns below 50 000 citizens (OR = 0.66, 95%CI: 0.48–0.90, $p < 0.001$).

DISCUSSION

The aim of the present study was to determine the scale of dietary supplements use among young children in Poland and, moreover, to determine the impact of socioeconomic factors and health status of children on supplements use. Currently in Poland, supplementation with vitamin D is recommended [11]. In the studied group, vitamin D supplements were used only by 3.0 % of children. In the group of children from the first grade of primary school, most commonly were used MVM and PUFA supplements. Analysis of the amount of PUFA administered showed that they were used as recommended on the package (one dose, once a day). However, most often they were given by parents' decision, without prior analysis of the diet. This indicates a risk of excessive or inadequate consumption.

In the present study, dietary supplements use was observed for every third child attending first class of primary school (32.4 %), regardless of gender or age. Even higher percentage was observed in Canada, where data from the 2004 Canadian Community Health Survey-Nutrition (n = 35 107) revealed that prevalence of vitamin/mineral supplement consumption among children aged 4–8 years was 44.3 % for boys and 45.0 % for girls [24]. Similarly in the United States, results from the National Health Interview Survey of 2007 provided information on children's dietary supplement use in the past month. A portion of 44.1 % of children aged 5–11 years took dietary supplements and, in this group, 38.9 % consumed MVM supplements [25]. Supplements consumption can decline with age. In a group of 210 girls aged 5 years, 44.4 % took dietary supplements but, at the age of 7, only 35.6 % continued to take supplements [26]. Much lower intake of dietary supplements was observed in studies conducted among pre-school children in Japan. Results from a Nationwide Survey (n = 2058) showed that only 8.0 % of children took supplements and in this

Tab. 3. Health and socio-economic status of children, depending on the use of dietary supplements.

Health and socioeconomic status	Suppl+ [%]	Suppl– [%]	p
Sex			
Boys	32.9	67.1	0.59
Girls	31.9	68.1	
Age			
6 years old	34.1	65.9	0.20
7 years old	33.8	66.2	
8 years old	31.9	68.1	
Child health status according to parent opinion			
Very good	30.6	69.4	0.97
Good	34.5	65.5	
Quite good	37.8	62.2	
Chronic disease			
Yes	43.2	56.8	< 0.001
No	30.6	69.4	
Place of residence			
Village	33.3	66.7	0.05
Small town (< 50 000 residents)	29.5	70.5	
Middle-sized town (50 000–100 000 residents)	38.8	61.2	
Town (> 100 000 residents)	31.5	68.5	
Mother's education level			
Basic/vocational	23.8	76.2	< 0.001
Secondary/technical	31.9	68.1	
Higher	39.8	60.2	
Father's education level			
Basic/vocational	25.9	74.1	< 0.001
Secondary/technical	35.8	64.2	
Higher	40.0	60.0	
Poverty risk indicator (*IZU*)			
Low	32.1	67.9	0.84
Medium	33.1	66.9	
High	31.8	68.2	
Household type			
Occupational	33.6	66.4	0.02
Agricultural	23.8	76.2	
Pension	30.0	70.0	
Non-profit	23.0	77.0	

Child health status defined as "bad" was excluded from the analysis, due to only one "yes" answer.
Suppl+ – children taking supplements, Suppl– – children not taking supplements, p – significance level obtained with the Pearson chi-square test.
IZU – abbreviation refers to Polish translation of Poverty risk indicator (Indeks zagrożenia ubóstwem).

Tab. 4. Use of dietary supplements depending on health and socio-economic status.

Health and socioeconomic status	*OR*	95%*CI*	*p*
Child health status according to parents' opinion			
Very good	0.73	0.46–1.15	ns
Good	0.87	0.54–1.39	ns
Quite good	1.00	REF	REF
Chronic disease			
Yes	1.72	1.33–2.2	< 0.001
No	1.00	REF	REF
Place of residence			
Village	0.78	0.59–1.06	ns
Small town (< 50 000 residents)	0.66	0.48–0.90	< 0.001
Middle-sized town (50 000–100 000 residents)	1.00	REF	REF
Town (> 100 000 residents)	0.73	0.53–0.99	0.04
Mother education level			
Basic/vocational	0.47	0.37–0.60	< 0.001
Secondary/technical	0.66	0.53–0.85	< 0.001
Higher	1.00	REF	REF
Father education level			
Basic/vocational	0.52	0.41–0.66	< 0.001
Secondary/technical	0.84	0.66–1.06	ns
Higher	1.00	REF	REF
Poverty risk indicator (*IZU*)			
Low	1.00	REF	REF
Medium	1.05	0.86–1.29	ns
High	0.99	0.79–1.24	ns
Household type			
Occupational	1.00	REF	REF
Agricultural	0.69	0.46–1.03	ns
Pension	0.82	0.32–2.21	ns
Non-Profit	0.59	0.39–0.89	0.01

Respondents aged 7.6 ± 0.6 years (n = 732, 366 boys, 367 girls). Child health status defined as "bad" was excluded from the analysis, due to only one "yes" answer.
OR – odds ratio, 95%*CI* – 95% confidence interval, p – significance level, ns – statistically not significant, REF – reference group, *IZU* – abbreviation refers to Polish translation of Poverty risk indicator (Indeks zagrożenia ubóstwem).

group only 2.1 % of children took them daily [27]. A similar percentage of children (30 %) aged 7–12 took dietary supplements in a study carried out in Warsaw, Poland [28]. In turn, slightly more children aged 6–12 years used dietary supplements in a study conducted in central Poland by Bylinowska et al. [29]. Among children in early school age (n = 743), more than 40 % of the group took at least one dietary supplement [29]. Among children taking at least one dietary supplement (n = 659) prevailed MVM formulas (45.5 %). PUFA supplements were also frequently administered (28.2 %), while the recommended supplementation of vitamin D was taken by only 3.3 % of children. Among children who took two or more preparations, the ratio was reversed, as 45.6 % took PUFA and 22.8 % MVM.

Meeting current vitamin D recommendations only through diet is very difficult. In a group of 2686 grade five students (aged 10–11 years) from Alberta, Canada, use of vitamin D supplements declared 29.5 % of examined children, although only 11.8 % took these supplements daily [30]. While vitamin D supplements use is below recommendations, MVM supplements are frequently used. Data from the Nutrition and Health Survey in Taiwan Elementary School Children (NAHSIT 2001–2002) showed that among 2417 children (aged 6–12 years), 22 % of them took dietary supplements [31]. Most frequently (30.3 %) were used MVM supplements, calcium took 17.9 % of children and cod-liver oil 12.5 %. Most of the examined children took only one type of dietary supplement (77.0 %) and 43.8 % used them regularly [31].

In the present study 80.3 % of children took supplements daily. In a study conducted by Vatanparast et al. [24], 83.0 % of children took supplements on a regular, daily basis. A study conducted in Poland on a group of 280 healthy children (aged 2–7 years) showed that parents considered supplementation as a good form of enriching children's diet, which resulted in the use of these products by 23.0 % of children [32]. Cod-liver oil and MVM supplements were given most frequently, especially in the form of jellies and sparkling candies. High acceptance and willingness to consume jelly supplements was noticed among children was noticed, which, as almost every fifth parent admitted, resulted in parental consent for consumption of a higher dose of the supplement than the one recommended on the package [32].

Socio-economic factors, such as level of education and household income, had a significant impact on health-related behaviour, including taking dietary supplements. In a previous study, the role of education was particularly emphasized [33]. Parental education is a primary determinant of family income. Moreover, well-educated parents tend to have better quality of parent–child interaction and report higher involvement with their children [34]. In the present study, parental level of education had a great influence on taking dietary

supplements ($p < 0.001$). Parents with high level of education, which in Poland means having at least a Bachelor's degree, more often gave their children dietary supplements. For both mothers and fathers with high education level, approximately 40 % gave their children dietary supplements, while among parents with basic education level only approximately 25 % of children were given dietary supplements. Other studies conducted in Poland also noted that mothers with higher and secondary education more often gave dietary supplements to their children than women with primary education (40.0–43.0 % vs 27.0 %). According to the authors of the study, this resulted from the greater awareness of the dietary mistakes made among parents with a higher level of education [29, 35]. In a study conducted in the United States by DWYER et al. [25] also parents with a high education level (at least a Bachelor's degree) more often gave their children dietary supplements (43 %) than parents with secondary (28 %) or basic (19 %) education level.

In the present study, more children received supplements in occupational households, where income is generated due to work performed personally regardless of the nature of employment (34.0 %). Also, a high percentage of children (30.0 %) received supplements in households living on pensions, compared with agricultural families (24.0 %) and those living on non-profit sources, like income from property or rent, being dependent on other people (23.0 %). Supplementation is often associated with a higher level of education, but also with a higher income. People in households living on pension tend to be still professionally active, having an additional part-time or even full-time job. It can contribute to higher income and explain the high intake of supplements in this type of household.

A study conducted in Japan domonstrated that parental high education level and high household monthly income were correlated with higher supplements intake. Approximately 40 % of children of fathers with higher education and approximately 34 % of children of mothers with higher education were taking dietary supplements. Parents with low education level less frequently gave dietary supplements to their children [31]. In a study conducted in Canada, children of parents with at least secondary graduation had 1.4 times higher chances of taking supplements than children of parents with lower education level [24].

In the present study, occurrence of a chronic disease was strongly connected with consuming dietary supplements, while the consumption of dietary supplements was inversely correlated with parents' education level, non-profitable sources of income and living in small towns or towns above 100 000 residents. For example, children with chronic diseases had 72.0 % higher chances of taking dietary supplements compared to healthy children.

The motivation for using dietary supplements can be various. Often children and parents report using supplements to improve general health, maintain health, enrich the diet, protect against disease development or boost immunity. Properly selected supplements, prescribed or recommended by the physician's, can be effective in supporting the treatment of chronic diseases [36]. In the presented study, 43.2 % of children with a chronic disease took dietary supplements. Similar to the present study, BYLINOWSKA et al. [29] did not find a connection between the use of dietary supplements and the parent's assessment of children's health status (age of 6–12 years), but the decision was influenced by occurrence of a disease. Among children aged 6–12 years in Poland, MVMs were more often administered to children who suffered from chronic diseases (56.0 % of ill children) in comparison with healthy children (37.0 %). Of the 121 children with disease, more than a half received dietary supplements. Of the 73 preparations administered, only 37 (51.0 %) were given on the basis of physician's recommendation and, in the case of 36 preparations, they were given on the basis of parents' decision. According to the authors of the study, administering dietary supplements to chronically ill children without consulting a physician poses a risk of interaction of MVM components with medications [29]. In a study conducted in the United States, children having an ill-health score of ≥ 3 points (indicating a risk of developing or present evident health problems, seeing a physician regularly) were more likely to use dietary supplements (both MVM or single vitamin or mineral, SVM). Over 38 % of these children took dietary supplements regularly [25]. According to the American Academy of Pediatrics, using MVMs or SVMs may be beneficial for children with a chronic disease, however, the importance of predicting possible interactions of the components of dietary supplements with medications is emphasized, especially among children taking various medications [37]. In accordance with the recommendations of the Polish Institute of Food and Nutrition, assessing the nutritional status of the body and first modifying the diet should precede introducing dietary supplements to the children's diet, and the dietary supplements should be only included in the diet after consultation with a physician [38].

In the present study, most frequently (67.0 % of children) supplements were given without any medical recommendation and primarily the parents made the decision (67.3 %). The high percentage of parents' decision on administering supplements was recorded irrespective of the mother's (67–69 %) and father's (65–70 %) level of education. This result indicates the need for parents' education, awareness of supplements functions, potential benefits and possible side effects, especially the risk of excessive oral consumption of dietary supplements. Only 29.0 % of children took supplements prescribed by a physician. Similarly, in a study conducted in Poland among children aged 7–12 years, administration of dietary supplements to children was most often the result of parents' decision (61.0 %) and not consultation with a physician (2.2 %) [28]. In the National Health and Nutrition Examination Survey 2007–2010 [36], researchers examined motivations for taking dietary supplements by children from birth to nineteen years of age (n = 8245). In the whole group, only 15.5 % of children took supplements based on the advice of a physician or other health care professional, while the rest of the children (84.5 %) took supplements by decision or self-selection made by their parents. The importance of physician's recommendation was higher among young children (aged ≤ 2 years, approximately 50 %) and declined with age. For children aged 6–11 years, an age group similar to that presented in this study, only 11.0 % of children took supplements based on the physician's recommendation [36]. In many countries (e.g. Canada, USA, Australia), dietary supplements can be used without consultation with a practitioner or prescription, leaving the possibility of self-selection by patients themselves [39]. In a study conducted in Poland, a majority of parents considered the use of supplements as safe, and only 11.0 % of them feared possible side effects [32]. Only every third parent (37.0 %) read the leaflets attached to the preparations and every fifth (21.0 %) did not inform the physician about the use of dietary supplements by the child [32]. This may be due to the fact that, in Poland, patients also do not need a medical prescription to buy dietary supplements and a medical consultation before purchase is not required. Parents frequently do not have the need to tell their physicians about giving dietary supplements to their children, probably because of fear of scepticism and lack of approval. Physicians themselves feel that herbal and dietary supplements should be more carefully regulated and controlled by the government [40]. The widespread use of dietary supplements in Poland, without consulting it with a dietitian or a physician, was recorded also in other age groups, like children attending sporting clubs, students, people who exercise regularly and adults in general [41].

According to the analysis of available data (unpublished results), individual nutritional education of parents changed their behaviour. An analysis of the nutritional value of children's diet, comparing it with standards and passing this information to parents reduced the percentage of parents from 67.0 % to 55.0 % in subjective decision-making about dietary supplementation. The importance of the physician's opinion increased by 10.0 % (from 29.0 % to 39.0 %), and the inclusion of a dietetician in making decisions on the use of dietary supplements by the children was also noted. High prevalence of dietary supplement use observed among children, especially without medical recommendation, indicates the need for parents' education, detailed analysis of the children's diet and determination of advisability of taking certain vitamin, mineral or dietary supplements that contain polyunsaturated fatty acids. Parents' education should include consultations with a dietetician, combined with an analysis of the child's diet, also during nutrition workshops or lectures with dietitians. In order to avoid hyperalimentation or an inadequate intake, dietary supplements should be used mainly for components of low intake, until a balanced diet is implemented. It seems reasonable that pediatricians systematically ask whether dietary supplements are used, when prescribing medications, in order to avoid possible interactions. It should be emphasized that the functions of dietary supplements are not prevention or treatment of various diseases, but enriching a proper diet in justified states, e.g. in a situation of increased demand or as an alternative before the implementation of a well-balanced diet.

The advantage of the present study was the assessment of the prevalence of the use of dietary supplements in a representative group of young children. Moreover, essential environmental factors were included in the assessment. A disadvantage of the paper is a lack of children's diet analysis. In subsequent studies, the use of dietary supplements should be combined with the analysis of the nutritional value of the children's diet to assess the accordance with nutritional standards. Especially it is important to indicate components taken in excessive amounts in order to prevent the negative effects of hyperalimentation, as other researchers have pointed out [15].

CONCLUSION

In a representative group of Polish children attending first grade of primary school, every third child took dietary supplements (32.4 %), most often MVM supplements (45.5 %) and formulas providing PUFA (28.2 %). Children with chronic disease, living in occupational or pension household types, were more likely to receive dietary supplements. Parents with higher education level were more likely to provide their children with dietary supplements and, regardless of the level of education, parents mostly decided to give their children dietary supplements or not. It is crucial to educate parents about the principles of proper nutrition and dietary supplementation, in order to consciously correct deficiencies, reduce unjustified dietary supplementation and reduce the risk of nutrient hyperalimentation.

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