

ORIGINAL PAPER

## Dietary supplements use among children from south-eastern Poland

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### ABSTRACT

**Aim of the study:** All over the world people are increasingly turning to dietary supplements, the market for which is growing every year. Unfortunately, still little is known about the use of dietary supplements in paediatric population. The aim of the study was to assess the frequency of use of dietary supplements among children in Lesser Poland Voivodeship and to verify the source of parents' knowledge about dietary supplements.

**Material and methods:** A multiple-purpose survey was conducted anonymously among 229 parents of patients hospitalized in the Department of Paediatrics, University Children's Hospital in Krakow. Each parent answered 41 questions regarding dietary supplements use in his/her hospitalized child throughout the whole child's life. The data was statistically analyzed.

**Results:** 71.4% of parents supply dietary supplements to their children, 57% admitted that they serve it daily. Parents most often give their children a single vitamin or mineral preparation (39.2%). Mostly the choice of a particular preparation was conditioned on the opinion of a physician (68%) or a pharmacist (37%). Families with a high socioeconomic status more often take advice from health professionals regarding their knowledge about supplements. Nearly half of the respondents admit that they do not have sufficient knowledge on the dietary supplements they give to their children.

**Conclusions:** Most parents give or gave dietary supplements to their children. Although a well-balanced diet provides all vitamins and micronutrients that young organisms need, many parents find it necessary to use dietary supplements. It is alarming how many people use alternative sources of information. It is necessary to educate and build awareness among parents that they take an active role and are responsible for their child's health and that they should have reliable knowledge about the preparations they decide to give their child.

### KEY WORDS:

**dietary supplements, food supplements, natural health product, supplement science.**

### INTRODUCTION

Dietary supplements are becoming more and more popular throughout the world. In Poland, the market of dietary supplements has been growing in recent years – in 2016, according to the Chief Sanitary Inspectorate, 7398 dietary supplements were registered, in 2019 this number doubled, reaching 24,121 new dietary supplements

in 2020 [1]. Data from the European Commission show that between 1997 and 2005 the Polish market of supplements grew by 219%, which was the highest growth among all European Union countries [2]. According to a report of the Supreme Audit Office, in the first half of 2015 Poles bought 94.5 million packages of dietary supplements, which is 10 million more than a similar period in 2014. The lack of legal regulations means that currently

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anyone can sell dietary supplements by merely declaring its composition to the relevant sanitary authorities [3, 4].

According to the Act on Food and Nutrition Safety, a dietary supplement is “a foodstuff the purpose of which is to supplement a normal diet, forming a concentrated source of vitamins or minerals or other substances having a nutritional or other physiological effect, single or complex, marketed in a form allowing dosage, in the form of: capsules, tablets, dragées and other similar forms, sachets with powder, ampoules with liquid, dropper bottles and other similar forms of liquids and powders intended to be consumed in small quantities, measured unit quantities, excluding products having the characteristics of a medicinal product under of the pharmaceutical law provisions” [5].

In Poland, it is obligatory to iodize table salt and enrich spreadable fats with vitamins A and D. Food producers often voluntarily enrich their products, such as breakfast cereals, with vitamins, and macro- and micro-elements.

Healthy children can achieve most of the recommended levels of intake from food alone. However, due to its northern latitude children in Poland are at risk of a lack of vitamin D [6]. Current Polish recommendations for the paediatric population include supplementation of vitamin D<sub>3</sub> and docosahexaenoic acid (DHA). Formula milks available on the market are enriched with vitamin D<sub>3</sub> and DHA [7]. In Polish climatic conditions, vitamin D must be additionally given to every infant until the age of 6 months, regardless of the feeding method, and after 6 months depending on the daily dose of vitamin D provided with food. For older children, there are also specific recommendations regarding vitamin D<sub>3</sub> supplementation, in various doses depending on body weight, dietary intake of vitamin D<sub>3</sub>, season of the year, and sun exposure [8]. For infants who have finished breastfeeding, additional supplementation with DHA is recommended at least to the end of the 2<sup>nd</sup> year of life [9].

In Poland there are few studies assessing the market of dietary supplements in the paediatric population. Existing studies, mainly surveys, are conducted with regard to small populations, and the results can be outdated in view of the growing market for supplements. In 2008, a survey evaluating the use of dietary supplements and fortified foods was conducted among children aged 7-12 years in a primary school in Warsaw. A total of 129 children took part in the study [10]. A year later, another study, also in the form of a survey, was published in which the use of supportive measures was checked with regard to the group of 141 adolescents from sports classes [11]. A slightly smaller study was conducted in the West Pomeranian Voivodeship, which assessed the popularity of dietary supplements among young athletes [12]. On the other hand, a study evaluating the influence of socioeconomic status and lifestyle on the consumption of dietary supplements among almost 1500 children and adolescents in central-eastern Poland was published in

2019 [13]. The results of most of these studies on dietary supplements coincide with European or American studies, showing the market developing year by year and the increasing influence of the media and advertising on the choice of dietary supplements.

## AIM OF THE STUDY

The aim of this study is to assess the frequency of use of dietary supplements by children in the Lesser Poland Voivodeship and to verify the source of parents' knowledge about dietary supplements.

## MATERIAL AND METHODS

A multiple-purpose survey was conducted among the parents of patients hospitalized in the Department of Paediatrics of the University Children's Hospital in Krakow, in the period from January to October 2018. This hospital hospitalizes children up to 18 years of age from south-eastern Poland, mainly from the Lesser Poland Voivodeship. Patients were hospitalized due to childhood infectious diseases, such as upper and lower respiratory tract infections, gastrointestinal tract infections, and urinary tract infections. Parents staying with their child in the ward were asked to complete a questionnaire on the use of dietary supplements for the currently hospitalized child. The children were without chronic diseases. They were orally informed by the investigator about completing the questionnaire based on their experience with the use of dietary supplements in relation to the child who is currently hospitalized. They were asked to consider the entire period of the child's life. The first part of the survey concerned the general characteristics of the hospitalized child and his/her parent (e.g. age, level of education, socioeconomic status [SES] of the family), whereas the second part included questions about the use of dietary supplements among the hospitalized child and sources of knowledge about them. Socio-economic status (SES) was based on the subjective assessment of the parents. Before the survey was conducted, the consent of the relevant Bioethics Committee (No. 1072.6120.6.2018) and the consent of the patient's parent were obtained. The categorical variables were compared by Pearson's  $\chi^2$  test or Fisher's exact test if 20% of cells had an expected count of less than 5. Two-sided *p*-values < 0.05 were considered statistically significant. All calculations were performed with JMP®, Version 15.2 (SAS Institute Inc., Cary, NC, USA).

## RESULTS

197 (86%) out of 229 parents were mothers. The mean parent age was 32.1 years (SD 6.2 years, range 18-54 years). The number of children per parent varied from 1 to 6, with a median of 2 [1, 2]. Detailed data regarding the parents' demographic information are summarized in Table 1.

## PARENTAL HABITS OF DIETARY USE OF SUPPLEMENTS IN THEIR CHILDREN

Most of the respondents (71.4%) were giving or had given dietary supplements to their children; women more often gave them to their children compared to men (74% vs. 55%,  $p = 0.03$ ), and more often those with higher than with secondary education (78% vs. 61%,  $p = 0.01$ ).

The parents most often gave their children a single vitamin/mineral preparation (39.2%). Multivitamin/multimineral preparation supplements were used in the offspring of 22.4% of the survey participants. Probiotics were also popular – 38.4% of parents gave them to their children.

Among parents who gave dietary supplements on a regular basis, 57% of the surveyed parents gave them to their children once a day. About half a smaller group gave dietary supplements to their children seasonally (25%).

Parents mainly bought dietary supplements from stationary pharmacies (83%).

The most popular forms of dietary supplements used in children are presented in Table 2.

## SOURCES OF KNOWLEDGE ABOUT DIETARY SUPPLEMENTS

The choice of a particular dietary supplement was mainly conditioned on the following: the physician's opinion (68%), pharmacist's opinion (37%), product composition (32%), friends' opinion (18%), ease of use (16%), product's reputation on the Internet (14%), and the price of the preparation (14%). A higher percentage of women, compared to the male respondents, were guided by a physician's opinion when choosing a dietary supplement (71% vs. 52%,  $p = 0.027$ ).

Parents obtained information about dietary supplements mainly from health professionals (62%), family/friends (44%), and the Internet (43%), and less often from television (16%) or newspapers (5%). The reputation of a given dietary supplement on the Internet was more often taken into account by younger parents when choosing a dietary supplement for their children (the mean age of parents who took into account opinions on the Internet was  $29 \pm 6.4$  years, and the mean age of those not guided by opinions on the Internet was  $33 \pm 4.4$  years,  $p = 0.0008$ ). Opinion on the Internet regarding dietary supplements was most important for parents with one child; parents with more than 3 children did not take into account this source of information at all ( $p = 0.008$ ).

## REASONS FOR USE OF DIETARY SUPPLEMENTS

As many as 81.2% of the respondents decided to administer dietary supplements to their child following a physician's recommendation, 17.8% gave a dietary supplement due to its reputation for supporting the child's

TABLE 1. Demographic characteristics of parents ( $N = 229$ )

| Factor                                 | <i>n</i> (%) |
|----------------------------------------|--------------|
| Number of children (below 18 y.)       |              |
| 1                                      | 102 (44.5)   |
| 2                                      | 91 (39.8)    |
| 3+                                     | 36 (15.7)    |
| Place of living                        |              |
| Rural area                             | 81 (35.4)    |
| City < 10,000 population               | 12 (5.2)     |
| City 10,000-100,000 population         | 28 (12.2)    |
| City > 100,000 population              | 107 (46.7)   |
| Subjective family socioeconomic status |              |
| High                                   | 158 (69.0)   |
| Moderate                               | 69 (30.1)    |
| Low                                    | 2 (0.9)      |
| Education – mother                     |              |
| Primary                                | 7 (3.1)      |
| Secondary                              | 75 (32.7)    |
| Bachelor                               | 11 (4.8)     |
| High                                   | 136 (59.4)   |
| Education – father                     |              |
| Primary                                | 13 (5.7)     |
| Secondary                              | 105 (45.9)   |
| Bachelor                               | 8 (3.5)      |
| High                                   | 10 (24.5)    |

TABLE 2. The most popular forms of dietary supplements used in children

| Supplement form      | %    |
|----------------------|------|
| Syrup                | 34.0 |
| Pill                 | 23.6 |
| Jelly beans          | 22.7 |
| Lollipops            | 14.4 |
| Effervescent tablets | 9.2  |
| Juice                | 8.3  |

organism, 10% administered a supplement following a pharmacist's suggestion, and 10% of the parents decided to administer dietary supplements on their own due to deficiencies in their child.

17.5% of the surveyed parents considered the use of dietary supplements to be necessary. 52% of parents believed that the use of dietary supplements brought health benefits to their children. Nearly 43% of parents believed that dietary supplements could help to correct deficiencies in vitamins and other dietary components. On the other hand, 23% of parents thought that giving food supplements to their children helped their devel-

**TABLE 3.** The frequency (%) of parents' motivation to use dietary supplements in children – data are presented in numerical values and percentages, survey participants could choose more than one answer

| Reason                                          | Surveyed parents, <i>n</i> = 227 (%) |
|-------------------------------------------------|--------------------------------------|
| To complete for vitamin or mineral deficiencies | 176 (77)                             |
| To increase the immunity of children            | 143 (63)                             |
| To recover faster                               | 87 (38)                              |
| To prevent health problems in children          | 67 (30)                              |
| To prevent weakness of the body                 | 48 (21)                              |
| Children have healthy skin/hair/nails           | 46 (20)                              |
| To improve the appetite                         | 35 (15)                              |
| For weight loss                                 | 11 (5)                               |
| To proper development of the brain              | 7 (3)                                |
| To grow up properly                             | 2 (< 1)                              |
| To prevent tooth decay                          | (< 1)                                |

opment and functioning, but they should only be used when there was a deficiency, and 7% thought that for this reason they should be given to every child. Also, 7% of parents believed that dietary supplements had no proven effect in supporting the child's normal development and functioning. A higher percentage of female respondents in comparison to male respondents believed that dietary supplements for children could help to supplement vitamin deficiencies and other necessary components in the diet (45% vs. 29%,  $p = 0.018$ ), while a higher percentage of male respondents believed that dietary supplements for children had no proven effect (19% vs. 5%,  $p = 0.018$ ) (Table 3).

#### PARENTAL KNOWLEDGE ABOUT DIETARY SUPPLEMENTS AND THEIR SIDE EFFECTS

The next part of the questionnaire concerned parents' knowledge about dietary supplements used in their children. Nearly half (45%) of the respondents admitted that they did not have sufficient knowledge about the functions of individual vitamins and minerals in the human body. Almost 12% of parents admitted that they did not know if they should continue to maintain a well-balanced diet for their children when they gave a multivitamin preparation to them. Lack of sufficient knowledge concerned mainly the surveyed fathers (29% of fathers and 9% of mothers,  $p = 0.004$ ). Nearly 53% of respondents did not know about the existence of or were aware of contraindications to the use of dietary supplements.

When analysing the parents' answers to questions about possible side effects occurring after use of dietary supplements by their children, it turned out that the majority (70%) of parents were aware of possible side

effects, while as many as 97% of the respondents had never noticed any side effects after administering dietary supplements to their children. Those who had observed side effects mainly mentioned gastrointestinal symptoms (diarrhoea, constipation, abdominal pain, nausea, lack of appetite) or skin symptoms (rash). 36% of parents emphasised that side effects could occur especially if dietary supplements were used contrary to the recommendations provided in the packaging or without indications (25%). Interestingly, the surveyed parents reported that the main source of information about possible side effects after giving dietary supplements to their child was the Internet (24%), followed by family or friends (19%), while health professionals accounted for only 13%. 15% of the respondents admitted that they did not read the leaflet accompanying the dietary supplements. On the other hand, 26% of parents did not check the composition of the dietary supplement chosen for their child or checked it only in selected cases. 15% of parents do not know if it was possible or did not think it was possible for children to overdose on food supplements.

#### IMPACT OF PARENTAL LEVEL OF EDUCATION, SES, AND PLACE OF LIVING ON THE USE OF DIETARY SUPPLEMENTS

The parents' education influenced the sources from which they obtain information about dietary supplements. 71% of mothers with higher education and only 49% of mothers with secondary education obtained information about dietary supplements for children from health care professionals ( $p = 0.003$ ). The same situation was true of the educational level of fathers (respectively, 72% vs. 55%,  $p = 0.036$ ). A higher proportion of fathers with higher education obtained information about dietary supplements for children from the Internet, in comparison to fathers with secondary education (51% vs. 33%,  $p = 0.019$ ).

The financial situation of the family and the place of residence also influenced the use of health professionals as a source of information about dietary supplements for children. A higher percentage of parents of children with a good financial situation obtained information about dietary supplements for children from health professionals, compared to parents with an average financial situation (67% vs. 54%,  $p = 0.03$ ). Similarly, a higher percentage of residents of large cities (> 100,000 residents) obtained information about dietary supplements for children from health professionals, compared to rural residents (respectively, 70% vs. 57.5%,  $p = 0.04$ ). The survey also showed that a higher percentage of residents of large cities (> 100,000 residents) obtained information about dietary supplements for children from the Internet, compared to rural residents (respectively, 50% vs. 41%,  $p = 0.049$ ).

Education had an influence on the awareness of contraindications to give dietary supplements to children;



namely, a higher percentage of fathers with higher education believed that there are contraindications to give dietary supplements to children compared to fathers with secondary education (58% vs. 36%,  $p = 0.02$ ).

## DISCUSSION

The results of the survey show that the use of dietary supplements in the paediatric population in the Lesser Poland Voivodeship is very common. The percentage of Polish parents giving dietary supplements to their children is significantly higher than in other countries [14, 15]. This can be influenced by the year-on-year growth in the market of dietary supplements and advertisements, higher awareness among parents about nutritional requirements of children, and easier access to dietary supplements.

Our survey showed that the most common motivation for administering dietary supplements to children was the desire to supplement vitamin and mineral deficiencies (77%). It is an open question whether parents check the level of appropriate vitamins in their child's body before administering preparations. In a study published in 2005, Eichenberger *et al.* proved that a well-balanced diet is sufficient to meet the recommended daily intake of vitamins and minerals [16], and the only substances that, according to current guidelines, should be supplemented in children are vitamin D and DHA. The parents we interviewed declared that they mainly give their children single-ingredient preparations.

In our questionnaire, we did not collect detailed data on each preparation used. However, the questionnaire was structured in such a way as to draw attention to single-component preparations of vitamins D, C, DHA, and iron; hence, these supplements most likely dominate in the group of people declaring giving children single preparations.

Interestingly, the opposite trend is observed worldwide. In a study by Bailey *et al.*, 86% of parents gave one preparation to their children, but most often a multivitamin [15]. Similar conclusions are provided by Briefel, who showed that 97% of children who were given dietary supplements received a multivitamin preparation [17].

Our results might be due to the fact that Polish guidelines recommend supplementing the diet of healthy children with only 2 substances: vitamin D<sub>3</sub> [18] and DHA [9]. Moreover, the cost of single-component preparations is often lower than that of multi-component preparations, especially branded ones. Importantly, use of a single-component supplement may reduce the risk of administration of just some nutrients that children probably need a little of and a lot of nutrients that are not needed.

Many parents use non-medical sources of information when choosing a particular preparation for their children. According to our survey data, as many as 44% of them rely on the advice of family and friends, 43% look for

information on the Internet, while 16% use information from television. In a survey evaluating the use of dietary supplements in children aged 7-12 years at a primary school in Warsaw, the main sources of parents' knowledge were leaflets (34%) and advertising (26%) [10]. Interestingly, it is not only parents who use alternative sources of knowledge. In a study assessing the popularity of dietary supplements among young people in the Greater Poland Voivodeship, the surveyed lower-secondary and secondary school students looked for information mainly in the media, leaflets, and advertisements in pharmacies [19]. In our study it is also disturbing that almost half (45%) of the respondents admitted that they did not have sufficient knowledge about the functions of individual vitamins and minerals in the human body.

In our study we showed that 81.2% of the respondents decided to administer a dietary supplement to their child upon the recommendation of the physician, and the choice of a particular preparation was determined mainly by the opinion of health professionals (68% physician, 37% pharmacist). This is surprising, because in a study of a population of American children only 15% of parents consulted a physician, and as many as 85% used supplements based on their own knowledge [15]. Also, in a study by Kozyrka *et al.* as many as 61% of parents made the decision to choose the preparation themselves [10].

Similarly to other studies worldwide, our survey underlines that the frequency of dietary supplement use is correlated with parents' socioeconomic status [15, 20, 21]. However, as a higher socioeconomic status is likely to be associated with a more balanced diet, giving additional dietary supplements to this target group may lead to their oversupply.

The analysis also shows that the parents' education and place of residence influence the choice of the source of information on the preparations used. Namely, mothers with higher education are significantly more likely (71% vs. 49%) to get advice on the use of supplements from health professionals, and the same is true for fathers (51% vs. 33%). In other studies we can find findings contrary to this result. A study by Young Du and Hildtraud Knopf reported that parents in the group with higher education were more likely to give their children vitamins than are parents in the group with lower socio-economic status [20]. However, it is worth noting that the percentage of parents with higher education is higher than the average in Poland according to the Central Statistical Office [22], perhaps because most of the responding parents lived in big cities.

When analysing parents' answers to questions about possible side effects occurring after giving supplements to their children, the majority (70%) of them were aware of their occurrence, while as many as 97% never noticed any side effects in their children. In contrast, the remaining 3% of respondents specified diarrhoea, constipation, abdominal pain, nausea, and lack of appetite among the

side effects. Our results are comparable to a survey conducted in Japan [23], in which 4.9% of parents noticed side effects of dietary supplements and also mentioned gastrointestinal symptoms (diarrhoea, constipation, nausea, vomiting, abdominal pain) as the main ones. In addition, the report of this study highlighted the possibility of interaction of dietary supplements with drugs and their effect on the absorption, bioavailability, or metabolism of drugs. The lack of adequate regulation, also in Japan, with the inappropriate use of these dietary agents creates potentially harmful effects on the body. A study by Or *et al.* conducted between 2004 and 2015 based on data from the FDA's Dietary Supplement Health and Education Act (DSHEA) described many adverse effects of various dietary supplements. Weight-loss pills, weight gainers, or energy boosters increased the risk of serious side effects on average by 3 times compared to vitamins. Note that even the vitamin products that were the control group were associated with various side effects and were included in the FDA report. The authors in their paper also pointed out that some side effects were not reported by patients to their physicians or the physicians did not notify the relevant institutions, or sometimes quite common complaints like those of the gastrointestinal tract were not associated with the use of vitamins or other health-support medications [24]. It is also possible that these side effects were due to the placebo effect; however, consumption of iron or fibre supplements may be the cause of the symptoms described above.

According to our survey, almost 53% of parents did not know whether there are contraindications to the use of dietary supplements, almost 12% of respondents admitted that they did not know whether a balanced diet was still necessary when using multivitamin preparations, and half of the respondents (45%) admitted that they did not have sufficient knowledge about individual vitamins and minerals in the human body.

There is a need for education in Poland, so that parents stop treating supplements as a substitute for a well-balanced diet for their children and consciously give their children only such preparations as they really need.

**Strengths:** The strength of our study is the large sample size. Furthermore, our article confirms the need to educate parents about possible dietary supplementation of their children.

**Limitations:** The study we conducted was a single-centre study. The survey questions assessed only parents' subjective knowledge of supplements used in children.

## CONCLUSIONS

The market of dietary supplements in the world as well as in Poland is very wide. Greater availability of the preparations and extensive advertising encourage parents to give dietary supplements to their children. Paediatricians working in primary health care institutions should

educate parents. It is essential to encourage parents to use reliable sources of information about dietary supplements, which can provide full knowledge about the supplement and its potential side effects. Primary health care paediatricians should also warn parents against overmedicating their children but also point out situations in which supplement administration can be beneficial. Further analysis of the paediatric population and the use of dietary supplements among them is needed because there are still too few studies in this patient group.

## DISCLOSURE

The authors declare no conflict of interest.

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