



Is nutritional education in primary schools needed in the light of teachers' diagnosis of the state of knowledge about food and nutrition of 7–12-year-old primary school pupils? The Focus Group Interview (FGI) – Junior-Edu-Żywnienie (JEŻ) Project

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Abstract

Introduction and Objective. School, as well family, are the most crucial institutions in creating the attitudes of children and adolescents toward food and nutrition. The coherency between impact on both of them, especially in terms of content, determines the results in improvement of these attitudes towards more prohealthy nutrition. Therefore, a nutritional education programme in primary schools, addressed to both pupils and parents, is necessary. The aim of this study is to identify the opinions of primary school teachers on nutrition education in relation to primary school pupils' knowledge and its sources of the principles of proper nutrition.

Materials and Method. In 2022–2023, qualitative research was conducted among primary school teachers (n=112; 25 FGIs group) using the FGI method. The focus group meetings were tape-recorded and transcribed. A written report was generated based on the independent evaluation of two staff members.

Results. Teachers mentioned several barriers to making changes in educational programmes in terms of introducing nutritional content, such as: necessity of extra time and money needed to purchase materials for practical exercises, lack of interest and skills in cooking, and insufficient knowledge about the health properties of food. Participants of group discussions shared ideas about programme content and delivery. Three teachers' profiles were identified in their approach to nutrition education of primary school pupils: 'engaged', 'skeptical' and 'indifferent'.

Conclusions. On the basis of the FGIs survey, it was concluded that the level of pupils' food and nutritional knowledge needs improvement, and that there is a need for a unified nutrition education programme in all schools on all educational levels, focused on the cooperation of teachers and pupils' parents.

Key words

primary school teachers, nutritional education, nutritional knowledge, Focus Group Interview (FGI)

INTRODUCTION

With the increasing prevalence of overweight and obesity worldwide, including Poland [1, 2], and the related problem of non-communicable chronic diseases [3], it is essential to implement measures in nutrition education. Nutrition education is understood as a combination of interventions aimed at changing dietary behaviour [4–8]. The overarching goal of education programmes is to enhance knowledge and

reinforce behavioural predictors that will, in turn, influence desirable lifestyle modifications, particularly in dietary behaviours and physical activity. These lifestyle modifications can subsequently help reduce the risk of chronic diseases such as obesity, cardiovascular disease and diabetes [3, 8]. Given the exposure of children to the long-term effects of poor nutrition and the effectiveness of the school period in terms of potential modification, preventive measures should commence as early as possible. Furthermore, their scope and format should be tailored to primary school pupils' perceptions at different stages of education [7, 9, 10].

One increasingly popular approach to conducting nutrition education programmes is to offer dedicated classes within the school setting, ideally led by either a classroom teacher or an

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external nutrition expert. Enhancing nutrition knowledge through education has proven to be an effective intervention in promoting the health of school-aged children [4, 8, 11].

It is essential to recognize, however, that the dietary behaviours of children and adolescents are influenced by various environments, with notable impacts from school, family, and peers. The attitudes and eating habits formed during this developmental stage significantly shape dietary patterns later in life [12–15].

Children's model eating behaviour, or more broadly, attitudes toward food and nutrition and physical activity are specific to the school environment, including peers and teachers. Teachers are important role models who spend a significant amount of time with children and have the opportunity to positively influence the expected outcomes of nutrition interventions. It has been proven that when teachers model positive behaviours, such as participating in a physical activity programme or eating fruits and vegetables, then pupils are more likely to emulate these behaviours [16, 17]. Hence, school education programmes [7, 12, 18] that include various types of healthy lifestyle activities play an important role. Available evidence suggests that comprehensive, multi-component school programmes have a stronger long-term potential to generate and maintain favourable health outcomes than single-component nutrition interventions [19–21].

Among the studies undertaken in Poland in the field of nutrition education [7, 18, 22–24], there is a distinct lack of qualitative research among teachers allowing, among other things, an exploration of the determinants of the implementation of nutrition education in elementary schools, the state of knowledge of pupils and their attitudes towards food and nutrition issues, and the possibility of developing and implementing appropriate preventive measures, including educational ones. This necessity is also emphasized by other authors [17, 25], according to whom it is important to explain why some nutritional education programmes do not have satisfactory results, and the scale of obesity and other non-communicable chronic diseases among pupils and adolescents, both in Poland and other countries, continues to increase [3].

Identification of teachers' expectations regarding the needs of nutrition education and the risk of the emergence of problems in this area is important, as it will allow to adequately prepare the forms and content of educational materials and methods focused on nutrition issues to popularise them both among pupils and their parents.

The aim of this study is to identify the opinions of elementary school teachers in different locations of Poland regarding nutrition education in relation to primary school pupils' knowledge and sources of knowledge on the principles of proper nutrition.

MATERIALS AND METHOD

Study design and participants. Qualitative research was conducted in 2022–2023 using the Focus Group Interview (FGI) method in 25 different locations, varied in size, across Poland. These included metropolitan cities with more than 500,000 residents, cities with 100,000 – 500,000 residents; small towns with up to 50,000 residents; and villages with 300 – 2,000 residents (Tab. 1). There were 4–8 teachers in each

focus group, depending on the capacity of the school facility, and consent of the teachers to participate in the discussions. A total of 112 teachers participated in the study. The participants were teachers of initial teaching, and teachers learning in classes IV–VI: nature/biology, chemistry, geography, physics, physical education, class teachers, pedagogues, computer science, techniques classes, health coordinators, and school club teachers. No intragroup conflicts were noted in any of the groups. The study was conducted at school, a setting familiar to teachers.

Table 1. Residence characteristics of teachers participating in the research

School code	School localization		Total No. of pupils at school	No. of teachers participating in the study
1	Warsaw	A	222	4
2	Warsaw		955	4
3	Warsaw		420	4
4	Warsaw		785	4
5	Warsaw		650	5
6	Warsaw		630	4
7	Warsaw		910	4
8	Warsaw		560	4
9	Poznań		700	4
10	Poznań		300	4
11	Lublin	B	1056	4
12	Białystok		1009	8
13	Kielce		415	6
14	Ostrowiec Świętokrzyski		465	6
15	Toruń		646	4
16	Tarnobrzeg		640	6
17	Nowy Sącz 1		200	5
18	Nowy Sącz 2		350	4
19	Brańszczyk	C	227	4
20	Muszyna		242	4
21	Ustka		306	4
22	Poręba	D	270	4
23	Trzcianka		75	4
24	Zielonki Parcele		540	4
25	Tylicz		215	4
Total				112

A – major cities with over 500,000 inhabitants; B – cities with populations ranging from 100,000 – 500,000; C – small towns with populations of 10,000 – 50,000; D – villages with various populations ranging from 330 – 2,000.

Data collection and protocols of the FGI. The researchers developed a moderation scenario for the group discussions which was tested in a pilot study, as a result of which identified errors and incomprehensible content were corrected. Written consent to participate in in-depth group discussions was obtained prior to the start of the study (FGI). The inclusion criteria for the study was the teacher's willingness to participate, confirmed by written consent. There were no exclusion criteria for participating in the focus groups.

The study was conducted with the assistance of two experienced moderators who initiated the discussion by posing introductory questions. They elucidated the guidelines regulating the group's conduct throughout the discussion,

underscoring the significance of confidentiality, respect for diverse opinions, and the imperative not to interrupt one another. The moderators fostered an environment where teachers were prompted to express themselves openly, sharing personal insights and experiences in harmony with the essence of the FGI method [26, 27]. The anonymity of statements was also preserved (quotes presented throughout the results section use only school location to protect the identity of participants).

Questions raised during the survey included: the current state of pupils' nutrition education, taking into account the content present in the current core curriculum in this area, the state of pupils' knowledge of the principles of proper nutrition, types of food and ways of its production, and their impact on the environment, scale and possibilities for reducing food waste, as well as sources of this interdisciplinary knowledge, including the role of social media in shaping nutrition behaviour. Teachers were also asked about the scope and feasibility of implementing nutrition education at school, and the educational resources and materials needed for this purpose. An attempt was also made to identify problems in the implementation of nutrition education in elementary schools. The qualitative study designed in this way was intended to deepen the source material on the subject obtained from the quantitative study conducted by the same team of researchers among teachers in a nationwide survey sample. The duration of the study was approximately 90 minutes. For more details on the assumptions and protocol of the research conducted as part of the scientific and educational Junior-Edu-Zywnienie (JEŻ) project, have been presented in a previous publication [28].

Procedures and data analysis. Researchers utilized several techniques to ensure trustworthiness. Procedures included maintaining detailed notes and memos for each interview, audio recordings (with teachers' permission), peer debriefing. Then the transcriptions and additional notes written by the facilitators were coded and analyzed in detail. The material obtained from the in-depth group discussions was then analyzed using principles of grounded theory [29]. Data analysis was conducted in a seven-step approach: familiarization with the data, thematic coding, identification of sub-themes within the main framework, review and revision of sub-themes, definition and naming of sub-themes, analysis, and interpretation of patterns across the data, and linking of sub-themes into dominant contextual domains. Interview transcriptions were initially analyzed by two independent researchers, and then a third person, when warranted, made decisions on the consensus of the opinions obtained [17]. The results were divided into thematic areas according to the FGI scenario, taking into account specific topics that appeared spontaneously during the interviews.

Ethical approval. This study received approval from the Bioethics Committee of the Ethics Committee at the Human Nutrition Sciences of Institute, Warsaw University of Life Sciences (Approval No. 18/2022), and was carried out in accordance with the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participating teachers before the interview. Data collected during FGIs were treated with strict confidentiality. Participants could resign from participating in FGI at any stage, without giving a reason.

RESULTS

Current status of nutrition education of primary school pupils. The group discussion was initiated with a question about the current situation in the field of nutrition education at school in relation to the content in the curricula on the principles of proper nutrition, the composition of food products and methods of their production. Questions were also asked about the impact of food production on the environment, and food waste and methods to reduce it. In general, in the curricula of elementary school grades I-VI, there was insufficient content relating to the principles of proper nutrition or food production and its impact on the environment, due to the lack of time to introduce new topics because of 'curricula overload'. At the same time, teachers were interested in these topics, especially those related to proper nutrition. They were also aware of their importance for pupils' health and intellectual performance and had often introduced these issues into various subjects, not necessarily *ex definitione* providing such opportunities. However, they were concerned that their contact with pupils is not long enough for educational activities to have lasting effects in changing their eating habits. Table 2 summarizes the most frequently mentioned issues on food and nutrition raised by teachers in various lessons.

The healthy eating programme is included in the schools' prevention and education programme, but as teachers point out there is lack of time to explore these topics more deeply. Many schools have a pro-health team of several people, made up of teachers who seek out various projects, including EU projects, and invite specialists in various fields (e.g., doctors, dentists, nutritionists) for lessons with pupils. Most nutrition education activities are carried out as part of so-called theme days or school holidays, among them, for example, "Healthy Breakfast Week", "World Health Day", "Pumpkin Day", "Apple Day", "Vege Day", "Spring Day", "Earth Day", "Our Planet Our Health". During these events, issues concerning the nutritional value of selected foods, their role in nutrition and their impact on health were discussed. Primary school pupils also learned about the types of food products in a practical way, preparing various dishes at home or at school, and the principles of food preparation hygiene were also discussed during the preparation of dishes. Schools often developed and implemented their own nutrition and health programmes such as "Let's swap chips for fruit", "A healthy meal is the power of vitamins." Many schools also declared participation in the nationwide "Keep Fit" programme, in foundation programmes such as 'School on a Fork', in the Warsaw programme 'I know what I eat', as well as in the EU programme coordinated by the National Center for Agricultural Support, 'Programme for Schools', which involves providing schools with fruits, vegetables and milk and dairy products. Some teachers declared that they had implemented food and nutrition issues as pedagogical innovations or their own original programmes.

While issues of the principles of rational or healthy nutrition were present in the didactic content implemented in various subjects, food production systems and their impact on the environment were much less frequently mentioned. Few schools had programmes on organic food production and comparison of organic and conventional food.

As part of the 'Earth Day' organized in many schools, a little more was mentioned about food waste, the impact

Table 2. Food and nutrition topics implemented in schools by teachers

Topics	School subject
Food pyramid, Healthy eating plate. Division of vegetables and fruits into colours. Planetary diet.	Early childhood education. Essential curriculum components. Art activities, posters in the school canteens.
Principles of proper nutrition and healthy lifestyle. Healthy Eating Day, Healthy Breakfast Day. Eating breakfast together with the teacher.	Early childhood education. Physical education. An hour with the educator. School-wide programmes, school events. Talks by the school nurse, invited persons, e.g. doctors, nutritionists, dentists.
Calculating the energy value of a dish/product; proportions, e.g., composition of a salad, cocktail.	Mathematics.
Grain – what's in the field, composition. Lessons 'From grain to bread' (organized by a local bakery).	Early childhood education.
Food composition – functional additives (preservatives, colours), packaging, how to read labels, expiration date.	Chemistry, Nature/Biology.
Elements of sustainability – water conservation, waste segregation, conservation of electricity, gas and other natural resources.	Biology, nature, cyclical school days e.g. "Earth Day".
Not wasting food.	Talks in education classes and encouragement to food sharing (foodsharing).
Eco programmemes, trips to organic farms, Protecting the planet, Environmental impact of food production.	Individually additional programme carried out in schools. During 'Earth Days', cleaning up the world, in geography lessons, biology lessons.
School gardens with herbs, vegetables; growing beans, cress, onions. School pot gardens, windowsill gardens.	Nature, day care centre activities, early childhood education.
Nutrition in different countries. Preparation of breakfast or meals (salads, sandwiches).	Occasional events: 'Spring Day', 'School Day', technology lessons, competitions, such as the school's Master Chef.
Cuisine in literature.	Polish language.
Regional cuisine, local food.	Collaboration with vocational schools, with village farmers' clubs, festivals.
Culture of eating food; setting the table.	On the occasion of class events.
Physical activity.	P.E. lessons, swimming pool, ecomobility project (how to get to school environmentally), 'Bike love in May'.

of food production on the planet, saving water, energy, gas and CO₂ emissions during the production of food. During group discussions, teachers also mentioned organizing a 'Share Food' campaign, as well as films about the threat to the planet. Issues of food waste tended to be implemented in metropolitan schools, while smaller towns and villages reported less interest in these topics. It can be assumed that the level of knowledge of children from these localities in this regard is low, due to the fact that these topics are not discussed either in family homes or in schools.

The implementation of nutrition topics most often involved nature teachers, biology teachers, PE teachers, educators, technology teachers, as well as others who discussed food and nutrition issues in single lessons, or action events at school. As mentioned earlier, according to the statements of the teachers surveyed, a lot of nutrition content was present as part of various thematic actions undertaken by teachers, with little effectiveness and efficiency in the form of relatively lasting changes in eating behaviour. During actions, such as healthy eating week, pupils become involved and try to eat properly, but later return to their given habits. One school even prepared a Cookbook to promote healthy eating. However, it is often observed that pupils return to improper eating habits after a particular school action. On the other hand, pupils who previously ate properly, in accordance with dietary recommendations, continued to do so, perpetuating correct habits. Teachers also mentioned that in several schools, especially in the younger grades, it was possible to improve the composition of 'breakfast foods', which included significantly more vegetables and fruits. Teachers

also stressed the effectiveness of years of education on the role of water in hydration, as evidenced by the fact that pupils increasingly carry bottles of water, which is their first choice, giving up sweetened sodas. Thus, teachers participating in in-depth group discussions concluded that children take on good role models, but they should be consistently pointed-out to them and perpetuated by building environmental models of proper eating behaviour.

Exemplifying the recalled opinions of teachers participating in in-depth group discussions, the following were their statements:

'There is content related to food and nutrition in the curricula, but there is not enough of it.' (Teacher, Brańszczyk).

'We discuss healthy lifestyles, engage in projects, including EU initiatives, and take various actions that contribute to knowledge. However, the topic of food waste is not currently addressed during our lessons.' (Teacher, Warsaw).

Level of nutrition knowledge among primary school pupils according to teachers. Another phase of thorough group discussions among teachers aimed to assess the extent of nutrition knowledge among elementary school students. This encompassed an examination of their understanding of proper nutrition, the composition of food products, food production methods, and their awareness of the impact on the environment or generally on the planet. Additionally, the discussions delved into the phenomenon of food waste.

The teachers' opinions about pupils' knowledge of nutrition was varied, which might be due to their own knowledge, as well as experiences, and location of the school. In general, teachers rated the state of pupils' knowledge in the aforementioned aspects as moderate, stressing that it depends primarily on parents' knowledge and awareness of these topics. At the same time, they noted that in recent years parents and children have been more conscious in choosing food when shopping together, which may indirectly indicate an increase in competence, and therefore knowledge, in this regard.

Feedback from teachers confirmed that pupils' nutritional knowledge is very often at odds with actual behaviour toward food and nutrition. Pupils know quite a lot about the subject, but do not apply this knowledge in practice. Thus, for example, they know that sweets are harmful, and even observe bringing sweets to school only on a designated day, but at the same time they take advantage of the offer of the school store or vending machines by buying sweet rolls, salty snacks, or sweet or carbonated drinks, succumbing to the influence of their peers. Teachers suspect that pupils' understanding of the topic is too broad. For instance, they may not have come across information regarding the detrimental impact of sugar found in sugary snacks and drinks on dental health, leading to tooth decay. Similarly, the adverse effects of snacking between meals, often associated with salty or sugary snacks, might not have been adequately addressed. According to teachers, pupils mostly understand what a healthy lifestyle means, most often equating it with five meals a day and physical activity, which may be due to their fairly frequent exposure to the 'Keep Fit!' programme, implemented nationwide. Of course, these observations refer to situations observed in the school environment, as teachers do not know how the principles of proper nutrition are implemented (followed) outside school. Teachers agreed that there must be consistency between the educational content conveyed at school and at home, and that parents and teachers should cooperate in this regard. They should work together to create pupils' eating habits, by, for example, eating a variety of foods, not just what children like, especially since many pupils are unfamiliar with a variety of products, and are not used to eating salads or vegetables.

The knowledge of primary school pupils about sustainability and not wasting food is much lower, according to teachers. They do not display attitudes indicating respect for food, as demonstrated, for example, by leaving uneaten lunch dishes in the cafeteria, or throwing into the trash sandwiches, milk drinks, as well as fruits and vegetables brought from home.

According to the teachers surveyed, younger children are often not interested in nutrition topics, and if they engage in such activities then when they are carried out in the form of play or practical activities (workshops). On the other hand, pupils in older grades are more likely to be exposed to topics in this area in biology and chemistry classes, concerning human anatomy, health, ecology, food additives or sustainability.

Examples of teachers' statements confirming the formulated observations include:

'Pupils have more knowledge than teachers their age and sometimes more than their parents. However, this knowledge is not correlated with practice.' (Teacher, Warsaw).

'Pupils' knowledge of nutrition is selectively extremely high, moderately good.' (Teacher, Pořęba).

Teachers on sources of knowledge about food and nutrition for pupils. In the next stage of moderation, the surveyed teachers, when asked about the sources of knowledge about food and nutrition among pupils, mainly emphasized their diversity, mentioning, among other things:

1. family home – from parents and other family members, such as grandparents, siblings;
2. peer environment, through observation and conversation with peers in the classroom, in the school canteen or day care centre, as well as in playgrounds, social gatherings;
3. school environment, during lessons implemented, such as according to the core curriculum, or by participating in additional school programmes, such as 'healthy breakfasts'.
4. internet, where pupils tend to seek entertainment rather than reliable information, such as through YouTube videos, older pupils with their own cell phones, as teachers indicated, exchange information among themselves and recommend videos that do not always present content in line with the science of human nutrition;
5. social media (Facebook, Messenger, TikTok); teachers emphasized the influence of influencers, YouTubers, bloggers;
6. TV, through programmes such as Junior MasterChef, for example.

However, as unanimously acknowledged by the surveyed teachers, parents, particularly those of younger children, stand out as the primary providers of food and nutrition knowledge. Indeed, some parents possess expertise in the subject and actively apply it in the family dietary practices. Moreover, they express readiness to collaborate with the school on diverse campaigns centred around themes related to food and nutrition.

However, there are some parents who delegate the upbringing and implementation of a healthy lifestyle and proper eating habits to the school. They do not organize their children's free time, explaining their work and the resulting responsibilities, which consequently promotes low physical activity of both children and other household members, atomization of family members and increased consumption of fast food, especially on free days. At the same time, such parents do not want advice, and object to teachers' meddling in their children's diets, which is typical for parents of obese children. Proposals for 'healthy breakfast foods' are boycotted by these parents, which encourages the children to bring chocolate bars, sugary yeast, or doughnuts to school. In their statements, some teachers mentioned a certain inconsistency among parents who, despite knowing that they should not give their children candy as a second breakfast, still provide it because it is more convenient for them, because of pupils' expectation.

Unfortunately, in the COVID-19 pandemic, children acquired or perpetuated bad habits. Lockdown and distance learning resulted in a decrease in physical activity, an increase in 'screen time', which was often associated with poor eating habits and an increase in the consumption of non-recommended products/foods, and snacking. On the other hand, it was observed that during the pandemic some children spent more time with other household members, including parents, participating in the preparation of meals

at home which was associated with better nutrition for entire families.

Teachers mostly expressed the opinion that if nutritional knowledge and healthy habits are instilled in children from kindergarten and reinforced at school, preferably in the form of regular, systematic activities, this can have a long-term positive effect in the choice of appropriate, recommended foods, which will consequently have a positive impact on their health. Respondents also stated that nutrition topics are of greater interest to girls. Boys, on the other hand, are more interested in dietary supplements, functional foods, especially if they train in a sport. The surveyed teachers also suggested the possibility of freely obtaining dietary advice that pupils and their parents could use, especially for children with excessive weight or eating disorders. Below are examples of teachers' statements that exemplify the above interpretation of the opinions presented during the in-depth group discussions:

'The Internet, social media (YouTube, TikTok) are the main sources of pupils' nutrition knowledge. Sometimes we are not able to compete with them.' (Teacher, Warsaw).

'Peers can be a source of nutrition knowledge. However, pupils don't talk about conscious nutrition, but rather about what they like, what is trendy. Older pupils are more aware of what they eat. However, these basics are brought from home.' (Teacher, Poznań).

'We have sports classes, so at school we try to instill a healthy lifestyle so that mental and physical health work together.' (Teacher, Poznań).

'Parents, unfortunately, often try to teach through prohibitions, without setting a good example themselves. It is then difficult to have positive consequences.' (Teacher, Warsaw).

Scope and implementation of nutrition education in primary schools. During in-depth group discussions among teachers, the question of the appropriateness of introducing a new subject into the elementary school curriculum, which would include nutrition education, was also raised. As a result of the discussion, two groups of respondents were identified: 'sceptics' of such a solution and 'enthusiastic'. The former, argued for their opinions by stating the overloading of the curriculum, which allows no room for additional teaching hours. At the same time, they believed that nutrition issues should be woven into the curriculum content at each stage of the teaching cycle in various subjects, with the greatest chance of success for their introduction seen in the younger grades. In doing so, they pointed out that for younger pupils, nutrition content should be conveyed mainly in the form of fun, workshops, contests, games, songs, rhymes or riddles. In the older grades, it could be discussions, contests, interest circles, cooking workshops, or various types of gamification, but on a limited basis, due to the fact that pupils often take additional classes in core subjects in order to get better grades, guaranteeing admission to their dream high schools. At the same time, it is the older pupils, especially girls, who are interested in nutrition issues.

The second group of teachers, more enthusiastic about the introduction of a subject on healthy nutrition into the programme, stressed that such a subject should also include other aspects of a healthy lifestyle (physical activity, stimulants, sleep) and should be implemented throughout the entire teaching cycle from 1st to 8th grade, in a manner

and to the extent adapted to the stage of development of pupils and their perception. They also stressed the need to ensure the attractiveness of such a subject, by making it as practical as possible and involving the pupils themselves in its implementation. Those in favour of introducing a subject dedicated to nutrition education stated that ideally, celebrities and specialists in the field should be involved in promoting healthy eating. In addition, they stressed the need for adequate training for teachers, preferably online, which would save them time and facilitate the availability of educational materials. This group of teachers also mentioned the necessity of support from parents, as there must be a synergy of school and family interactions. At the same time, the organization of school nutrition must be consistent, both in terms of school stores, vending machines and school canteens, as well as school celebrations and excursions, which should be places for the promotion of health-oriented food. The model way of nutrition education is to combine theory and practice.

'Nutrition education is first and foremost about imparting one's knowledge 'in person'. We teachers are supposed to 'lead by example.' (Teacher, Warsaw).

'The key is the consistent nature of these activities – shared second breakfasts at school, and going to lunch together. It's crucial to incorporate discussions on nutrition at every possible opportunity.' (teacher, Nowy Sącz).

'A great influence on nutritional knowledge is practical activities. When we see, touch, do, try, it has more meaning than when we just hear.' (Teacher, Poznań).

The needs reported by teachers for implementation nutritional education at school. Another topic explored during in-depth group discussions among teachers was the identification of their needs regarding tools essential for nutrition education. When discussing this matter, respondents predominantly emphasized the importance of educational materials tailored to the specific age groups of pupils (Tab. 3).

Teachers also mentioned ready-made lesson plans with worksheets, multimedia presentations and materials that the pupils can take home. Attention was also paid to the necessary financial resources, without which it is impossible to conduct nutrition education effectively. This is especially true for the practical part of such classes, where funds are needed for raw materials, as well as for the involvement of experts to conduct some classes. Teachers also suggested that some classes, e.g., workshops with pupils, should be held with the participation of parents.

Classrooms for the implementation of such classes are the dream of many teachers, since according to them, practice is the most important thing. In such classrooms, equipped with small catering equipment and appliances, such as a juicer, blender, blender and kitchen utensils, as well as access to water, it would be possible to prepare dishes with health-promoting properties, and teach pupils about human nutrition in a practical way. Ideally, the pupils' workstations should be mobile to adapt the room to the needs of the moment and in certain spatial conditions.

Among the topics that teachers believe should be included in the curriculum are: the principles of proper nutrition, nutrients and their sources, role in the body, planning and composing meals, diet-related diseases, planetary diet, different types of diets, eating disorders (anorexia,

Table 3. Needs reported by teachers for nutrition education at school

Subtheme	Teachers' opinions propositions
Healthy eating meanings.	Increase pupils' nutritional knowledge and awareness.
Healthy eating motivations.	Strengthen the desire to eat properly, taking into account allergens in food.
Healthy eating knowledge sources.	Ready-made lesson plans, educational boards and charts, multimedia materials, colouring books, leaflets, bookmarks, short films up to 5 min. in an entertaining way treating healthy nutrition, books: children's cookbooks, comic books, work cards, games, puzzles, board games, nutrition apps, genre scenes.
Eating practices.	Shared breakfasts with teachers, suggestions for composing 'healthy breakfast boxes'. Monitoring the appropriate assortment of food in school stores, vending machines, cafeterias, catering offerings.
Healthy traditional meals.	Consult with nutritionists to modify traditional dishes in a more health-promoting direction; reformulation proposals.
Family counseling.	Necessary cooperation with parents, collaborative workshops of pupils together with parents.
Holistic nutritional education.	Learning about sustainability and consumption; planetary diet; not wasting food, saving water, energy, gas. Teaching social responsibility to pupils, their families and school community.
Preferences for intervention.	Cyclical activities, thematic blocks, classrooms.

bulimia, etc.), the impact of diet on health, allergies, food production systems, food processing, preventing food waste, waste segregation, building consumer awareness, shopping planning, health-oriented cooking workshops, calculating the energy value of dishes, healthy lifestyles.

Sample teacher statements:

'Nutrition education should be for all pupils, once a week, once every two weeks, to consolidate knowledge. It should also be differentiated in terms of theoretical and practical knowledge.' (Teacher, Toruń).

'There should be support for already existing curricula, suggestions on how to do it in lessons in various subjects.' (Teacher, Trzcianka).

'It certainly takes to implement nutrition education in teaching, ready-made materials, charts, videos, etc. Currently, teachers look for information when preparing for classes on the Internet. Need a database of age-grouped materials.' (Teacher, Muszyna).

Barriers to implementing nutrition education in primary school. Some teachers do not see any risk in introducing a new subject, recognizing that the earlier it could be introduced the better, which could contribute to improving nutrition and consolidating proper eating habits among pupils. On the other hand, teachers who are skeptical, see various barriers to introducing a subject dedicated only to nutrition education (Tab. 4).

Profiles of primary school teachers due to their reported needs for pupil nutrition education. Based on the FGIs conducted and the identified teachers' opinions on topics related to nutrition education for elementary school pupils, three teacher profiles were identified: 'engaged', 'sceptical' and 'indifferent' (Tab. 5).

Among the information summarized in Table 5, it is worth noting that there is a relatively high percentage of teachers who are sceptical and indifferent towards the provision of nutrition education in schools, despite being employed in educational institutions recruited to implement the 'Junior-Edu-Żywnienie' project. It can be assumed that this scepticism and indifference stem from an awareness of the numerous limitations associated with implementing such a programme, including the potential burden on the core curriculum.

DISCUSSION

The presented FGI survey is one of the few of its kind, both in Poland and worldwide, to identify the level of knowledge about food and nutrition and the ways in which it is acquired by elementary school pupils, as perceived by their teachers, as well as the views of the teachers themselves on the need for nutrition education at school and any barriers and limitations associated with it.

The survey of teachers found that elementary school pupils represent a moderate level of nutritional knowledge, with little practical implementation. Most pupils have a general understanding of why healthy eating is important, but the problem comes down to the need to implement this knowledge into healthy eating behaviours [30]. Studies by other authors show that children and adolescents have knowledge of foods that benefit health, and are aware that healthy eating involves moderation, balance and variety of food. Despite this knowledge, they do not follow healthy eating recommendations and often consume foods even though they know they are not recommended. Such a tendency can be seen as universal from historical as well as the geographical point of view. Barriers to pupils' healthy eating included lack of time, limited availability of prohealthy foods at home and school, taste, and a general lack of concern about following healthy eating recommendations [31]. In addition, according to a study by Iniguez et al. [30], no change in nutritional knowledge and behaviour, or in pupils' understanding of the importance/essence of healthy eating, was demonstrated after the implementation of a nutrition education programme.

Based on the feedback from surveyed teachers, the extent of nutritional knowledge among elementary school students exhibits significant variation. This variance could be attributed, on one hand, to varying degrees of deliberate parental involvement in this area, and, on the other hand, to the fortuitous or temporary educational interactions within the school, as emphasized by other authors [13, 21, 32, 33]. According to the teachers, primary school pupils acquire their knowledge of food and nutrition from diverse sources, with the school, primarily through teachers, playing a significant role, along with contributions from parents and health professionals. This aligns with findings from other researchers who underscore the family as a crucial environment influencing children's eating habits [15, 32, 34]. Pupils additionally obtain information from non-personal

Table 4. Barriers to the implementation of healthy eating education in primary schools

Barriers	Specification	Teachers/ school – Pupils
Personal teachers	Professional preparation of teachers.	Inadequate competencies – training and educational materials needed.
	Workload of classes and professional duties.	Lack of time, willingness and financial motivation, feeling of excessive responsibility for pupils in the situation of too many classes.
Personal pupils	Taste and cravings.	Advertisements for sweets and salty snacks, sweetened drinks, and exposure to these products on school grounds in school stores and vending machines, making it difficult to assimilate and implement choices of healthier counterparts to these products. Pupils are often characterized by food neophobia, are accustomed to homemade flavours, and some are not at all familiar with them, and are reluctant to consume unfamiliar foods.
	Easy access to 'junk food'.	The need to monitor the offer of school stores and vending machines to eliminate 'junk food' on school premises.
	Educational problems.	Problems with pupils with psycho-physical maladjustments creating educational difficulties (Asperger's, autism spectrum, etc.).
	Gender differences.	Girls are more interested in nutrition, especially diets of various kinds. Boys, especially those training in sports, are interested in supplements to improve performance/results.
	Ways of knowing about healthy eating 'Meanings,' 'Motivations', 'Knowledge Sources'.	Low nutritional awareness among pupils and their parents. Lack of motivation from peers, family.
Environmental	Family practices. Eating What's Easy.	Lack of cooperation between school/teachers and parents. Improper eating habits in families.
	Cultural foods and traditions/ or healthier traditional Meals.	Neophobia of pupils and parents; low level of nutritional knowledge and reluctance to introduce new products; convenience as a determinant of unfavorable food choices.
	School infrastructure.	Lack of adequate facilities and equipment.
	School stores, vending machines.	Too high a share of non-recommended food products, inconsistency between teaching and easy availability of these products on offer on school premises.
Formal	Curriculum.	Lack of systemic solutions, urgent need for a decision to make nutrition education universally mandatory; long-term programme, same in all schools.
	Time.	Lack of time for additional activities, overloaded core curriculum, need to modify the programme.
	Finances.	Funds needed to equip rooms and buy raw materials for workshops.
	Competencies.	Need for additional training, as well as educational materials and tools, such as lesson plans.

Table 5. Profiles of teachers in their approach to nutrition education for pupils

Criteria	Profile of teachers		
	'engaged' n=70	'skeptical' n=32	'indifferent' n=10
Approaches to nutrition education.	Engaged, often volunteering, submitting and implementing their own innovative educational programmes, creative.	Less engaged, implementing the minimum resulting from the school's prevention and education programme and core curriculum.	Not involved in additional activities; not reporting a need for nutrition education.
Implementation of nutrition education by teachers.	Lessons, projects, extra-curricular activities, clubs, school and class holidays.	Involve themselves as much as necessary (it is required) – in class holidays, school holidays, assemblies, school trips taking into account the theme of food and nutrition.	Implement only mandatory topics in lessons, resulting from the core curriculum.
Nutrition knowledge and teachers' attitudes towards its exploration.	Big, they educate themselves, they are interested in this subject, invite specialists to school classes and additional activities.	Knowledge at an average level. They would be happy to participate in additional activities from time to time.	Knowledge at the basic level. Not very willing to engage in additional activities. Possibility of additional training only as part of working hours.
Sources of nutrition knowledge and engaged to acquiring it.	Post-graduate studies, free training for teachers, Internet, professional books.	Mainly Internet, sometimes textbooks/specialized studies.	Internet.
Teachers' needs in the implementation of nutrition education	Training preferably online, classrooms, more teaching aids.	Ready-made lesson plans with worksheets.	They are not convinced of the need for nutrition education, when outside of school pupils do not eat 'healthy'.

sources, such as the media, the Internet in particular, and food labels [21].

There are potential links between parents' eating behaviours and children's attitudes and practices toward food and nutrition [15]. Parents play an important role in shaping children's eating behaviour, both through inherited genes and exposure to the foods they buy and prepare for consumption at home, creating an environment that is relevant to the eating behaviour of all household members.

Parents are the ones who influence children's food preferences and behaviours, making only certain (selected) products available to them and acting as role models for them [32, 34].

Teachers participating in the study recognized the need to promote healthy eating and implement nutrition education programmes in schools, which is also confirmed by previous studies [4, 12, 17]. However, it should be noted that teachers play a key role in imparting information and practical skills about food and nutrition. Hence, in order for

them to be a reliable and credible source of information on nutrition and health, they must be equipped with adequate knowledge. Teachers' knowledge of these topics influences their willingness and confidence to teach about pro-healthy lifestyles, including healthy eating, which ultimately makes the implementation of nutrition education programmes in schools more attractive. It is also important that teachers not only know enough about healthy eating, but also that they implement this knowledge in their behaviour to be recognized as authentic promoters of a pro-healthy lifestyle. In achieving the power of teachers to change the eating behaviour of pupils, consistent actions addressed to them are needed, supporting them with educational tools, as well as promoting effective educational methods, including pointing out the role of practical activities in modelling proper eating behaviour of pupils. Thus, if teachers are to provide high-quality activities that promote healthy lifestyles and are to be persuasive role models, they need more support and adequate training in nutrition knowledge and practical classroom techniques [4, 12, 35].

Pupils spend a lot of time in school, therefore they are ideal places to implement comprehensive nutrition interventions because of their ability to promote healthy behaviours at the population level, reaching them from diverse backgrounds and family members. School is a unique environment where learning and personal development are key objectives of daily activities. It provides an excellent environment for nurturing and reinforcing healthy behaviours in order to cultivate a health-oriented lifestyle from early childhood through adulthood and into later adulthood [8, 12, 35]. Indeed, research indicates that healthy eating habits in childhood are crucial for proper physical and mental development, help prevent malnutrition, and in the long term, lower the risk of developing diet-related diseases [3].

Educators advocate the development of integrated programmes between the ministries of education, health, teachers, children and parents to ensure that nutrition education is comprehensive and reinforced in different settings, as other authors also point out [12, 21, 25, 35]. Of course, the influence of the main educational environments, namely the family and the school, will be all the more effective the more consistent the content conveyed by these institutions.

Pupils' eating behaviour is also influenced by the availability of certain food products at school, e.g. as a result of ongoing programmes, such as those promoting the consumption of fruits and vegetables, milk and processed foods, water, promoting school meals, e.g. shared second breakfasts eaten in class with the teacher, lunchtime meals, as well as jointly organized thematic events on food and nutrition (e.g. 'Healthy Eating Week'), and actions related to promoting physical activity (e.g. 'Bicycle May') [18, 24, 36].

Teachers, as already noted, have an important influence on pupils' behaviour, sometimes greater than that of their parents, and thus can effectively encourage pupils to introduce proper eating habits, such as eating breakfast every day. Teachers' opinions suggest that in order to improve the nutritional status of school-aged children, educational activities should be long-term, multifaceted with practical elements, carried out by properly trained personnel with the cooperation of parents and the support of the local government and Ministry of Education. This is consistent with a recent literature review and meta-analysis that emphasize the greater effectiveness of

multi-component interventions (programmes) that combine a family and school (teacher) component, focusing on content, teacher training and curriculum design [12, 20]. At the same time, the teacher expressed concern that it might be difficult to introduce these issues into an already overloaded core curriculum. In addition, as mentioned previously, according to the statements of the teachers surveyed, much of the nutrition content is present as part of the various thematic actions undertaken by them, with their effectiveness and efficiency in the form of relatively lasting changes in dietary behaviour, as well as a reduction in the risk of overweight and obesity, however, was small and often limited to the duration of these actions, as confirmed by previous studies [4, 8].

Among other barriers, the teachers surveyed cited personal, socio-cultural (easy access to junk food, cultural (traditional cuisine), and structural (finances, time) constraints. These barriers are also pointed out by other researchers, adding that it is also constituted by the family due to inappropriate eating behaviours at home [15, 17]. Involving the family in school nutrition programmes could promote positive communication between pupils and parents, and provide additional opportunities for pupils to share the knowledge and skills they are learning, sometimes passing them on to others (e.g. acting as a group leader) [30], also participating in the purchasing of food and joint meal preparation. However, it is important to remember that for most pupils, especially younger ones, it is the parents who decide on the meals eaten at home and the availability of food [15, 34, 37]. Teachers also expressed that some parents may not cooperate with them for several reasons, including lack of money for 'healthy food', lack of time to prepare meals, as well as low or lack of nutritional awareness. They suggested that in order to improve the nutritional status of school-aged children, it would be effective not only to train teachers, but also to raise awareness among parents. This would also achieve a synergistic effect of school and family interactions in modelling the proper eating behaviour of the younger generation.

Limitations of the study. Although there are limitations to using Focus Group Interview (FGI) as a data collection technique in that the data is not quantitative, which makes it difficult to analyze participants' responses, group dynamics affect responses, and some of the group's suggestions may be inappropriate. Nevertheless, the richness, diversity and innovation of the data obtained make FGI among teachers a valuable method for obtaining information. This is especially important if it concerns such important issues as topics related to the impact of children's and adolescents' lifestyles on their development, functioning at school and health – now and in the future in adult life. Hence, the data thus obtained through loose statements and discussions during the FGIs can be helpful for creating guidelines/recommendations for schools in terms of the pro-health education provided [17, 35], as well as creating new curricula and modifying existing core curricula.

Implications. Future food and nutrition education programmes should offer teachers more instrumental and substantive support, together with adequate training in nutrition knowledge and applied techniques. This would empower them to conduct high-quality activities promoting proper nutrition. A comprehensive and multifaceted

programme is essential to encourage behaviours aimed at transforming the lifestyles of pupils and their families.

In the light of the obtained results, ongoing monitoring of the school's involvement is crucial, particularly that of teaching staff and those responsible for organizing food in the institution, to influence the shift in pupils' lifestyles towards a more health-promoting direction. Special attention should be given to eating behaviours and physical activity.

These efforts should align with involving parents to maximize the impact of educational environments synergistically. However, planned future programmes require longer intervention periods and extended evaluations to observe lasting effects, as meaningful change is typically a gradual process. Adequate funding and support, including involvement from researchers, are imperative for the development and implementation of health promotion programmes, including those focused on the school nutrition environment.

CONCLUSIONS

The Focus Group Interviews (FGIs) revealed a moderate level of nutritional knowledge among pupils, with limited practical implementation. A noteworthy observation was the expressed need, articulated by a significant number of surveyed teachers, for a unified and comprehensive nutrition education programme to be uniformly implemented across all schools throughout the entire period of students' education. However, this necessitates modifications to the core curriculum, the availability of reliable educational materials, and an enhancement of teachers' competencies in this domain.

Teachers also underlined the importance of collaboration in nutrition education between the school (involving teachers and those responsible for nutrition) and the family (including parents, grandparents, and siblings) to consistently convey nutritional content and its practical application.

The insights collected from teachers' statements further confirmed the necessity for additional quantitative research to ascertain the specificity of the obtained recommendations to a broader population of teachers. The research should also evaluate the effectiveness of nutrition education programmes implemented in schools in altering students' eating behaviours, in order to reduce the risk of developing overweight and non-communicable diseases.

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