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CHALLENGES OF DIETARY INTAKE ASSESSMENT IN PRESCHOOL CHILDREN – CONCLUSIONS FROM A DIETARY INTERVENTION STUDY ON POLISH PRESCHOOLERS¹

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Summary

Aim. The aim was to present difficulties connected with dietary intake assessment in preschoolers which we concluded from a dietary intervention study.

Results. The intervention study aimed to modify preschoolers' dietary intake and physical activity to improve their nutritional status and physical fitness. We chose a seven-day weighed food record to ensure the highest validity of the results and to reduce the risk of casualness. One of the difficulties was the fact that the data had to be recorded by several people, including preschool staff and family members. The necessity to weigh and write down all foods consumed by the children was one of the most frequent complaint from parents and preschool staff and reason for withdrawing some children from the study.

To calculate energy and nutrient intakes, we used Dieta which we think is the best such computer programme in Poland. However, it does not provide the possibility to add to its database new dishes, foodstuffs or supplements.

The effort of keeping the food record was the discouraging factor for many parents to take part in the study. Preschool staff were dissatisfied with many of the dietary changes. Most parents were highly dissatisfied with the effort to introduce dietary changes at home.

Summary. When selecting method of dietary intake, seven-day weighed food record should be preferred. The Dieta is a very useful tool for calculating dietary intakes, however it requires urgent improvements. Dietary intervention studies in preschoolers should last longer than a preschool year and should include extensive education of preschool staff and parents.

Key words: dietary intake, food record, intervention programme, nutrition education, preschool children

INTRODUCTION

Preschool children are one of the most important groups of people in the society. If the country and the society are able to provide adequate conditions for them to develop appropriately and to adopt a healthy lifestyle, they will form in the future a healthy society. One of the main features of a healthy society is low morbidity and mortality from diet-related diseases. But it is not only a matter of a healthy society but also of an affluent society since diet-related diseases pose a considerable economic burden. Reducing the prevalence of diet-related diseases by modifying dietary intake in the society, may bring substantial economic benefits (1).

The living conditions of people in the developed countries are very favourable for the development of diet-related diseases. These conditions include easy ac-

cess to public transport, availability of cars, varied television programmes, computers in more and more households, the opportunity to communicate with other people without the necessity to move out of home due to the access to the Internet, all of which significantly reduce daily physical activity. This reduction in physical activity level may be observed among preschool children (2-6). But these conditions include also more and more processed foodstuffs, easy access to cheap energy-dense foods rich in saturated fatty acids and non-milk extrinsic sugars but poor in essential fatty acids or vitamins, as well as sweets and fast foods which are advertised heavily especially to young people. It is therefore not surprising that food habits of preschool children are not in line with current nutrition recommendations (7-9) and that nutritional knowledge of their parents is poor (10-14).

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The effect of the abovementioned conditions is decreasing physical activity level in the societies of the developed countries along with poor nutritional values of the daily diets, both of which are causes of diet-related diseases. Inappropriate dietary intakes rank highest among the risk factors for death in Western Europe, while physical inactivity takes the fifth place (15). Therefore, prevention of diet-related diseases should focus on popularising a healthy lifestyle which includes not only physical activity but also – or rather first of all – a balanced diet. The easiest way to physically active society characterised by adequate energy and nutrient intakes is to raise children on a healthy diet and teach them healthy food habits and active ways of spending time (16-18).

Preschool children should be taught how to eat healthy not only because they should acquire healthy food habits for the whole life but also because diet-related diseases develop slowly for many years and may have their origin as early as in childhood. That is why dietary intake assessment in preschool children should be considered one of the most important tasks of any country which aims to have a healthy society. Knowledge on dietary intakes of preschoolers is indispensable to work out and implement nutrition intervention programmes to teach them and their parents how to eat healthy.

However, the information about dietary intakes in Polish preschoolers is sparse. The most details on dietary intakes of children aged 4 to 6 years are included in a national study on a representative sample carried out by Szponar et al. (19). Two other studies provide information about intake of energy and selected nutrients in 4-6-year-olds from Szczecin (20) and Warsaw (21) and one study – about dietary intakes of 3-year-old children who attended preschools in Kraków (22). The results of these studies (19, 20, 22) showed many inadequacies in preschoolers' diets. Other information about what preschool children eat are based on the assessment of preschool menus (23-35) which means only the assessment of the meals offered to children, not necessarily equivalent to what they really ate. In several studies, food habits of preschool children were assessed (7-9, 36-39) which is very important but gives no information about intake of energy and nutrients. However, no intervention studies on Polish preschool children have been published so far.

The reason for those few studies on dietary intake assessment in preschoolers may be many difficulties which the researcher has to face. However, if these difficulties are well-defined, the researcher may prepare adequately to such assessment and prevent them.

AIM

The aim of this study was to present difficulties connected with the dietary intake assessment in preschool children which are concluded from a dietary intervention study on Polish preschoolers.

METHODOLOGICAL OUTLINE OF THE DIETARY INTERVENTION STUDY ON POLISH PRESCHOOLERS

The aim of our intervention study was to modify preschoolers' dietary intake and physical activity in order to improve their nutritional status and physical fitness which is of highest importance in the prevention of diet-related diseases. We assessed dietary intakes from a 7-day weighed food record and estimated physical activity by means of accelerometers, ActiGraph GT3X. Indices of nutritional status included anthropometric, biochemical and haematological indices. To obtain anthropometric indices, we measured body weight and body height, as well as body composition by bioelectrical impedance. Biochemical indices were serum glucose, protein, total cholesterol, HDL cholesterol, LDL cholesterol, triacylglycerols, iron, iron binding capacity, ferritin, transferrin, sodium, potassium, calcium, magnesium and phosphorus. Moreover, children's blood pressure was taken. Physical fitness was assessed using physical fitness test for preschool children worked out by Sekita (40) which we used in our previous study (41). This test allows to determine the level of agility, power, strength and speed.

All these measurements were made at the beginning of the preschool year and were followed by modification of the preschool menus and education of the preschool staff and children's parents. The education included nutritional and physical activity recommendations for the preschool children. At the end of the preschool year, all the abovementioned measurements were repeated.

SELECTING METHOD OF DIETARY INTAKE ASSESSMENT

Food record, as well as 24-hour dietary recall and food frequency questionnaire, are the methods most frequently used to assess dietary intake. Although from among these methods, food record requires the most effort from both the researcher and the studied person, we chose a seven-day weighed food record because it is considered to ensure the highest validity of the results (42). With this method, the information is recorded at consumption which eliminates the problem of forgetting (42, 43). Another decision to be taken is the period of recording food intake. If it is shorter than the whole week, appropriate days in an appropriate proportion should be selected, for example for a three-day period, two weekdays and Saturday or Sunday should be chosen. However, in Poland many people on Friday eat in a different way than on other weekdays, so Friday should be included as one of those two weekdays. To eliminate the problem of choosing the days of the week and also to reduce the risk of casualness, we applied a seven-day period of recording food intake.

One of additional difficulties when assessing dietary intake in preschool children is the fact that the data must be recorded by several people. Preschool teacher or other members of the preschool staff should record

the data during preschool hours, while during the time outside preschool, the data should be written down by all people who look after the child, that is by children's parents or other members of the family, but also for example a baby-sitter. One of the most frequent complaint which we heard from parents and preschool staff, was the necessity to weigh and write down all foods and beverages consumed by the children. This was the reason for withdrawing 10% of children from the study at the beginning of preschool year, that is during the first measurements, and 7% of children at the end of preschool year when the measurements were to be repeated.

Since food record requires writing down detailed information on all the foods consumed, which means that it is time-consuming and burdensome for the studied person (42), it is very difficult to receive parents' consent for their children's participation in the study. Having to keep the food record was one of the main causes of receiving only 154 written consents from among parents of 234 children who were invited to take part in the study.

CALCULATING INTAKE OF ENERGY AND NUTRIENTS

To calculate intake of energy and nutrients in the studied children, we used Dieta computer programme, version 4.0, worked out by the National Food and Nutrition Institute in Warsaw. In our opinion, this is the best such computer programme in Poland. The user may obtain from it intake of energy and intake of as many as 89 nutrients. Also, intakes of energy from protein, fat and carbohydrates are calculated. The calculations made in the Dieta are based on Polish food composition tables (44). It is possible to calculate nutritional value of not only foodstuffs, but also typical Polish dishes, including the possibility of modifying some ingredients of a dish, such as the kind of fat/oil used for cooking. The losses of nutrients resulting from food processing are also estimated by the programme. Even supplements available in Poland are included in the database.

However, when introducing the data from the food records to the database, we encountered numerous difficulties. The first challenge was to introduce to the database the meals consumed by the children during their stay in the preschool. We obtained from the preschool staff detailed information about the way of preparing all dishes and beverages, such as types and amounts of ingredients and cooking methods. Although there are many dishes in the Dieta, we could not use them because the recipes in the programme are not provided and even if they would be, we could not use them either because there is very little probability that they would be the same as those used in the preschools. Moreover, the recipes during the intervention were totally changed so using the recipes from the Dieta would not show any changes in the dietary intake and would be far from the true intake. Unfortunately, the Dieta does not provide the possibility of introducing to its database a dish based on a specific

recipe. This makes introducing the data highly time-consuming because this means that we had to calculate the amount of each ingredient in 100 g of a dish or beverage, then calculate the amount of each ingredient in the portion consumed by each child and then introduce the calculated amount of each ingredient into the database. It was burdensome even in the case of a dish or beverage composed of two or three ingredients, but most dishes, especially dinner dishes, were composed of eight to seventeen ingredients. Therefore, it is necessary to include in the Dieta the option of adding a dish based on a specific recipe, for example an option 'add a new dish' would open a window in which the user would introduce all the ingredients, as well as the type of cooking method, and these information would be saved under a specific name, such as 'tomato soup – preschool in Piła'. The programme would calculate automatically the nutritional value of such a dish and the user would add the necessary amount of the dish by selecting 'tomato soup – preschool in Piła' instead of introducing each ingredient one by one.

Another difficulty was that the studied children consumed many foodstuffs which were not included in the database of the Dieta. However, in such a situation, we managed to receive detailed information from the producer about ingredients and nutritional value. Unfortunately, the Dieta does not offer an option of introducing new foodstuffs. In the situation of a lacking foodstuff, we had to add its nutritional value to the results exported from the Dieta to the Microsoft Excel programme taking into account the amount consumed by a given child.

Although there are many supplements included in the database of the Dieta, not all of those taken by the studied children were found. Of course, it is not possible for the authors of the programme to include all the supplements on sale in Poland, particularly when taking into account that every year many new supplements are introduced. Therefore, the programme should offer the possibility to add a supplement to the database which is very easy because producers are obliged to provide detailed information on nutritional value. Again, in the case of a lacking supplement, we had to add its nutritional value to the results exported from the Dieta to the Microsoft Excel programme taking into account the amount consumed by a given child.

Finally, after having exported the results from the Dieta to the Microsoft Excel and having added nutritional values of the lacking foodstuffs and supplements, we had to correct the results because some foodstuffs in the Dieta do not contain information about some nutrients. For example, rice cakes have 7.6 g of total protein, but 0 g of plant protein although all the ingredients are of plant origin and there cannot be animal protein.

We also performed some additional calculations in the Microsoft Excel which will be useful for us when presenting the results in the next articles. These calculations include: energy intake per kg of body weight, total

protein intake per kg of body weight, animal and plant protein intakes expressed as % of total protein intake, energy from fatty acids, lactose, sucrose and starch. It would be highly favourable if these calculations could be obtained from the Dieta.

We were working on the Dieta 4.0 and since then a new version 5.0 has been released. However, this version does not include the options which we think are indispensable and the abovementioned gaps in the nutritional values of some foodstuffs are still to be eliminated. In our opinion, if version 6.0 will include these improvements, it will be an excellent computer programme to assess dietary intakes.

THE DIFFICULTIES OF CONDUCTING AN INTERVENTION STUDY

It seemed to us obvious that all parents, as well as the preschool staff, will be delighted to take part in the study considering it as an opportunity to have all detailed measurements taken for their children and to gain knowledge about healthy diet free of charge. However, it turned out that the first discouraging factor was the effort connected with keeping the food record, as mentioned above. The preschool staff turned out to be unwilling to introduce the changes in preschool menus, although the heads of the preschools seemed eager to take part in the intervention. On the one hand, both preschool teachers and kitchen staff claimed that improving children's diets is very important for their health and development, but on the other hand they were not willing to give up using butter and sugar or to reduce substantially the amount of added salt. They felt dissatisfied with such a simple modification as not adding sugar to tea. Moreover, offering a modified dish to preschoolers required some effort to convince the children that this tastes well. The most troubles with accepting new meals by the children were in those groups of children whose teachers did not want to eat the modified meals.

Most of the children's parents were also highly dissatisfied when it turned out that they have to take some effort to introduce changes to meals prepared at home and to change the kinds of foodstuffs bought every day for their family. Many parents were so unwilling to give up eating unhealthy foodstuffs preferred but that they did not want to change anything even for the sake of their children's and their own health. Even those parents who suffered from diet-related diseases or were warned by us that for example their excessive body weight or high blood pressure poses a risk for their early death, although were scared at first, they finally did not introduce any changes. Moreover, many parents were so used to some nutritional stereotypes or unhealthy food habits practised in their family homes that any negotiations about modifying them caused strong emotions.

Our intervention showed that modifying dietary intake needs a long time of educating preschool staff

and parents before introducing any changes. A long period of time would allow to introduce the changes more slowly. If parents would be willing to cooperate, the changes could be introduced step by step giving for example one month for introducing two to three easy changes. Both preschool staff's and parents' aversion to dietary changes shows the urgent need to work out and implement more intervention studies which would use our experience and to spread nutritional knowledge in the mass media.

SUMMARY

1. When selecting method of dietary intake, seven-day weighed food record should be preferred to ensure more accurate results.
2. The Dieta computer programme is a very useful tool for calculating dietary intakes, however it requires urgent improvement.
3. Dietary intervention studies in preschoolers should last longer than a preschool year and should include extensive education of both preschool staff and parents. □

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