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Elementary school projects as a possibility of improving pupils' eating habits

Bine Dobnikar, Tamara Poklar Vatovec
University of Primorska, Faculty of Health Sciences, Izola, Slovenia
bine.dobnikar@gmail.com; tamara.vatovec@fvz.upr.si

Abstract

Introduction: At the Stane Žagar primary school in Kranj, there are two projects taking place we had focused on, defining their role on education about nutrition. Projekt 2° Zelene strehe and Tradicionalni slovenski zajtrk. The first provides an additional space for high quality learning environment. Pupils need to take care of the green roof and plants, which helps them to learn about responsibility. The latter provides them knowledge not only about importance of breakfast consumption, but also about locally produced food, beekeeping and local farming. It consists of bread, milk, butter, honey and an apple or other fresh or dried fruit without any added sugars. *Methods:* In spring 2021 we conducted a survey. There were 59 pupils in the sample from three 7th grade classes. The purpose was to determine what their eating habits are like. Based on those we inferred what their knowledge is on nutrition. We conducted a quiz on Kahoot platform, there were 10 questions regarding the content we presented. We used an OPKP programme to calculate nutritional and energy values of traditional Slovenian breakfast. *Results:* On average, this breakfast provides 1604 kJ (382 kcal), which is 16 % of daily energy requirements for pupils in age group 13–14 years. 10 % of the breakfast is composed of protein, 26 % of fats and 64 % of carbohydrates. Results of the questionnaire have shown that less than half of pupils eat breakfast daily. The frequency of wholegrains and legumes consumption is also low. Pupils mostly consume one or two sorts of fruit per day (68 %), but 17 % of them don't include fruits in their diet every day. 47 % of pupils eat vegetables every day, mostly one or two sorts per day. Females consume more wholegrain product (36 %) than males (27 %). Most pupils, 67 females and 74 % males, drink water. 76 % of pupils have between 3 and meals per day. We used quiz on Kahoot platform to evaluate their knowledge on guidelines for balanced nutrition. The most pupils expressed their opinion on the issue of '*What is in the lowest*

layer of the nutrition pyramid scheme?' as we have presented the new nutrition pyramid scheme, which they have not met yet. *Discussion and conclusions:* Some edible plants are grown on the green roof, mostly berries. In plant-based foods there are bioactive compounds. They not only have antioxidant properties but also play a role in lowering risk for some noncommunicable diseases. Both projects carry a great potential in educating pupils and improving their eating habits. We suggest upgrading the projects with interactive contents, thus pupils would be more effectively presented the purpose of balanced nutrition. Questionnaire results show pupils' eating habits are not suitable, hence we inferred their knowledge on nutrition is insufficient. Implementing such projects might be beneficial for their knowledge. By upgrading the projects, additional information would be provided and changes in eating habits would be encouraged.

Keywords: Eating habits, traditional Slovenian breakfast, green roof, plant foods, antioxidants

Introduction

Balanced diet is very important for pupils. Guidelines for balanced diet suggest having regular and evenly distributed meals throughout a day. Consequently consuption of meals is more frequent and quantity of foods consumed is smaller. This is thought to be beneficial for blood fatty acids and blood glucose levels, which reflects in improved abilities of pupils during lessons. Pupils should have breakfast at home and it should consist of whole-grain foods, such as whole grain bread, cereals or porridge. Blood glucose levels elevation is slower, which contributes to improved pupils' abilities during lessons (Gabrijelčič, Pograjc, Gregorič, Adamič and Čampa, 2005).

Daily intake of protein for children and adolescents is 0,9 – 1g/kg or 10–15 % of daily energy intake (DEI). Sources of protein are lean meat, fish, eggs, milk and dairy products, legumes and nuts. Pupils' energy intake from fats should cover 30–35 % of DEI. Fats are further divided into groups: monounstaturated fatty acids, polyunsaturated fatty acids and saturated fatty acids. Unsaturated fatty acids altogether are recommended to cover 20 % of DEI. Monounsaturated fatty acids are recommended to cover 10–13 % of DEI, polyunsaturated fatty acids 7–10 %. Omega-6 and omega-3 fatty acids are in the group of polyunsaturated fatty acids, former should cover 2,5 % of DEI and latter 0,5 %. Carbohydrates are recommended to cover over 50 % of DEI. However, pupils have to choose carefully. Sugars belong in the group of carbohydrates as well, and yet they should be limited up to 10 % of DEI. Complex carbohydrates are recommended, such as whole-grain foods which also contain dietary fibre (Gabrijelčič et al., 2005).

Since meals in school represent only one part of pupils' diet, they need additional knowledge to be able to choose and prepare balanced meals at home as well. They could get some additional knowledge about nutrition from projects,

which take place in elementary school. In this article, we have highlighted two projects, which take place in Elementary school of Stane Žagar Kranj. First project is *Traditional slovenian breakfast* (Tradicionalni slovenski zajtrk) and the second is *Project 2° Green roof* (Projekt 2° Zelene strehe) (Ministrstvo za kmetijstvo, gozdarstvo in prehrano, 2018).

Traditional slovenian breakfast takes place every year in november and is composed of locally produced foods. It is the same every year, there are bread, milk, butter, honey and an apple. Bread must be made in Slovenia, whereas other foods must be produced and processed in Slovenia (Ministrstvo za kmetijstvo, gozdarstvo in prehrano, 2018). Project 2° Green roof has started in 2020, therefore it is new to schol (Eko sklad, 2020). There are many edible plants planted there, including strawberries, raspberries, grapes, aronia and some herbs. The roof is surrounded by a fence and is safe to walk on. There are two separate spaces on the roof, purposely built as outdoor clasrooms (Kandus and Skubic, 2020).

Berries planted on the green roof are rich in antioxidants, some vitamins and minerals. Their energy value is low, however their nutritional value is high (Mikulič-Petkovšek, Koron, Zorenc in Veberič, 2017). Berries also contain some dietary fibre. The most abundant antioxidants in berries are vitamin C, flavonoids and athocyanins (Burton-Freeman, Sandhu in Edirisinghe, 2016).

Methods

In spring 2021 we conducted a survey. There were 59 pupils from three 7th grade classes in the sample. 36 (61%) were female and 23 (39%) were male. 35 (59%) of pupils were 12 years old at the time of conducting our survey, 22 (37%) were 13 years old and two (3%) were 15 years old. We handed out the surveys and consensus in a paper form to pupils. Parents had to sign the consensus. The survey had 30 questions, the majority referring to eating habits. Some questions also referred to habits during the covid pandemic, exercise and their own opinion of their body mass. Most of them were closed or multiple chioce questions. One was an open question. The purpose was to determine what their eating habits are like. Based on their answers we inferred what their knowledge is on nutrition. Pupils had about one week to complete the survey and return it. We collected them on the same day we gave short lectures about balanced nutrition.

We prepared a 45 minutes long lecture based on nutritional guidelines for educational institutions and general guidelines. We divided our lecture into two parts. 30 minutes of lecture and 15 minutes for discussion and the quiz. Lecture covered the topics of: number and frequency of meals in a day; guidelines for choosing carbohydrates, protein and fats; choosing drinks; how to prepare a meal based on macronutrient guidelines. We prepared the quiz on the Kahoot platform, there were 10 questions referring to balanced diet and exercise. All of them were multiple choice questions.

We used an OPKP programme to calculate nutritional and energy values of traditional Slovenian breakfast. We processed the results from the survey with an Excel Microsoft Office 365 programme.

Results

Traditional slovenian breakfast

Traditional slovenian breakfast is composed of bread, milk, honey, butter and an apple (Ministrstvo za kmetijstvo, gozdarstvo in prehrano, 2018). As dietitians we suggest consumption of whole grain bread from locally produced grains, such as wheat whole grain bread or whole grain bread with different seeds. An advantage of whole-grain bread is, that it has more dietary fibre compared to white bread and thus more minerals, vitamins and micronutrients (Prehrana.si, n. d.e). Honey should be consumed carefully, since it has high energy density. We suggest consuming no more than two tea spoons of honey per day, considering children don't consume any sugars with other sweet foods (Prehrana.si, n. d.c). Milk has high nutrient and low energy density, it is a source of quality protein. We need to introduce pupils to low-fat dairy products, because fatty acids in dairy products are mostly saturated. As children start elementary school, we suggest they consume only semi-skimmed milk. Substitution of milk for fermented dairy products, such as yoghurt, is also encouraged, since it contains more probiotic bacteria and is easier to digest (Prehrana.si, n d.d). A fruit included in the breakfast should be fresh and locally produced. Another choice is dried fruit without added sugars (Pravilnik o izvajanju projekta Tradicionalni slovenski zajtrk, 2020).

Table 1: Foods in an average traditional slovenian breakfast and their energy values.

Food	*Whole grain bread*	*Milk, semi-skimmed*	*Butter*	*Honey*	*Apple*	*Altogether*
Quantity (g)	50	200	15	20	111	397
Energy value (kcal)	100	75	74	67	67	382
Energy value (kJ)	420	315	310	281	281	1604

DEI for pupils in age group 13–14 years is 10080 kJ (2400 kcal) (Nacionalni inštitut za javno zdravje, 2020). An average traditional slovenian breakfast has 1604 kJ (Table 1) and represents 16% of DEI in an above mentioned age group. Figure 1 shows that 10% of energy value of traditional slovenian breakfast is obtained from protein, 26% from fats and 64% from carbohydrates (OPKP, 2021).

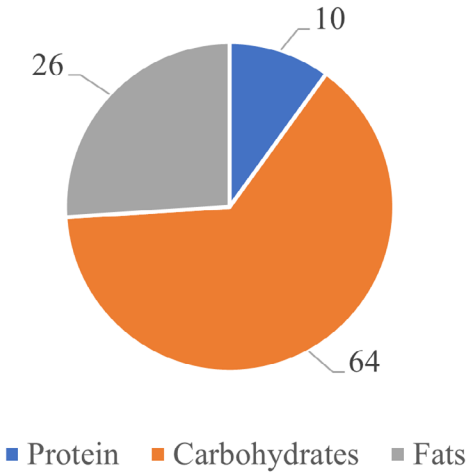

Figure 1: Energy (%) from macronutrients in an average traditional slovenian breakfast.

Survey results

We conducted a survey in three 7th grade classes. 59 pupils completed it, 36 (61%) were female and 23 (39%) were male. 35 (59%) pupils were 12 years old, 22 (37%) were 13 years old and two (3%) were 15 years old. They had to complete 30 questions. 29 questions were closed or multiple choice questions, one question was an open one.

Sorts of fruits and vegetables consumed: the majority of male pupils, 11 (48%), consume 2 different sorts of fruit every day, five (22%) consume one sort of fruit, three (13%) three sorts of fruit or more every day and four (17%) do not consume fruit every day. The results were similar for female pupils, 14 (39%) of them have two different sorts of fruit every day, ten (28%) have one sort of fruit, six (17%) have three different sorts of fruit every day or more and six (17%) do not have fruit every day. 13 (22%) pupils consume one sort of vegetables, 19 (32%) consume two sorts, eight (14%) consume three sorts and 13 (22%) consume four sorts of vegetables or more every day. Six (10%) of pupils do not consume vegetables daily.

Frequency of ruits and vegetables consumed: 31 (53%) pupils consume fruit every day, 21 (36%) consume pupils consume it three to five times per week, five (8%) once per week and two (3%) pupils never consume fruit. 28 (47%) of pupils consume vegetables every day, 23 (39%) consume it three to five times per week and six (10%) one per week. Two (3%) never consume vegetables.

Bread, pasta and flour: 58 (98%) pupils answered the question, what kind of bread, pasta and flour they use more often to prepare their meals; white or wholegrain. The results have showed that more pupils use white bread, pasta and flour, 16 (73%) male pupils and 23 (64%) female pupils. Only six (27%) male pupils and 13 (36%) female pupils use whole grain bread, pasta and flour.

The majority of pupils consume whole grain foods, such as porridge, cereals or semolina once per week, those are 19 (32 %). Only three (5%) consume those foods daily, 14 (24%) three to five times per week, 18 (31%) one to three times per month and five (8%) never consume those foods.

Drinks they consume at least once or twice every week: 57 (97%) pupils drink water, 21 (91%) male and 36 (100%) female. 19 (83%) males and 19 (53%) females drink fruit juice. Ten (43%) males and 16 (44%) females drink unsweetened tea. Five (22%) males and five (14%) females drink energy drinks. 13 (57%) males and three (14%) females drink soda.

Drink consumed the most: Water is a drink pupils consume most often, 17 (74%) males and 24 (67%) females. Fruit juice follows on second place with five (22%) males and seven (19%) females.

Meals and breakfast: 58 (98%) pupils answered a question, what is the average number of meals, they have every day. The majority, 45 (76%) pupils, have three to five meals per day. Three (5%) have more than six meals and ten (17%) have less than three meals every day. 22 (37%) pupils have breakfast every day, 13 (22%) three to five times per week and 24 (41%) once per week or less.

Self opinion of body mass: we did not ask pupils to reveal us their body mass only to express their self opinion of their body mass. They were given three choices: body mass is normal / too high / too low. 17 (74%) males and 27 (75%) females stated their body mass is normal. Four (17%) males and six (17%) females stated it is too high and two (9%) males and three (8%) females stated it is too low.

Exercise and screentime during the pandemic in 2020 and first quarter of 2021 compared to exersise and screentime before the pandemic: 25 (42%) pupils exercised the same and 19 (32%) exercised more. The minority of them exercised less, those were 15 (25%). However, there were 42 (71%) pupils who answered they have had more screentime during the pandemic. 16 (27%) pupils have had the same screentime and one (2%) has had less.

Table 2: Answers to some other questions (n).

Question	*Daily*	*3-5 times per week*	*Once per week*	*1-3 times per month*	*Never*
How often do you eat breakfast?	22	13	8	3	13
How often do you eat dairy products (milk, yoghurt, cottage cheese, kefir)?	21	26	4	7	1
How often do you help to prepare meals?	12	20	17	5	4
How often do you use fats, such as butter, whipping cream, sour cream or pork fat for preparing your meals?	4	26	17	10	2

Question	*Daily*	*3-5 times per week*	*Once per week*	*1-3 times per month*	*Never*
How often do you add salt in your meals (soup, sauce, potatoes)?	11	12	17	6	13
How often do you eat fried food?	0	10	21	27	0
How often do you eat eggs?	4	18	27	8	2
How often do you eat fast food?	0	2	14	35	7
How often do you eat snacks, such as flips, chips, crackers, pretzel sticks or salted peanuts?	1	18	27	12	1
How often do you eat sweets or desserts?	3	19	27	7	3
How often do you eat nuts (hazelnuts, almonds, peanuts, walnuts)?	3	11	20	19	6
How often do you eat processed meat foods, such as pate, hot-dogs or meat cheese?	3	8	28	17	2
How often do you eat legumes, such as peas, beans or chickpeas?	0	9	17	19	14
How often do you eat toast intead of bread?	4	10	24	18	3

Lecture

We had given a short lecture in all three 7th grade classes. We included basic information on topics of: guidelines for balanced nutrition; macronutrients; the food pyramid; how to build a balanced and healthy plate; importance of having breakfast every day; healthy food preparation methods; limited usage of salt. A lecture lasted for 30–35 minutes. After the lecture we carried out a short quiz to evaluate their knowledge on guidelines for balanced nutrition, we prepared earlier on Kahoot platform. Since not all of the pupils had owned a smartphone, we had a group discussion about the questions on Kahoot. The majority of questions were referring to our lecture. They mostly answered the questions correctly, however they did not express their opinions often to build a discussion. The most pupils expressed their opinion on the issue of '*What is in the lowest layer of the nutrition pyramid scheme?*' as we have presented the new nutrition pyramid scheme, which they have not met yet.

Discussion

The project Traditional slovenian breakfast is educating pupils about the advantages of locally produced food. Local food is more mature and ripe at time of harvesting, thus it is more rich in micronutrients and has a higher nutrition-

al value. Flavour of fruits, vegetables and other foods is more rich, traditional (Ministrstvo za kmetijstvo, gozdarstvo in prehrano, 2018).

Anthocyanins are a subgroup of flavonoids and can be found in berries, aronia and grapes (Tsuda, 2011; Ramos, 2014). Some researches on animals imply they may have a role in obesity management (Tsuda, 2011); adipose cells function improvement; improved metabolism of triacilglicerides; and they might reduce the risk of developing metabolic syndrome and obesity (Ramos, 2014). Researches on humans have alighted the role of anthocyanins in management of type 2 diabetes and in prevention of cardiovascular diseases (Tsuda, 2011; Ramos, 2014).

It has been prooven that vitamin C has antioxidative properties, however taking vitamin C in dietary supplements does not lower risk for diseases, such as stroke or cancer. However, it has shown beneficial effects in women who were pregnant and smoking, they had lower risk for an early birth (Higdon, Drake, Angelo and Delage, 2018). Less ripe fruits contain more acids, including vitamin C, their content decreases with ripening (Mikulič-Petkovšek, Koron, Zorenc and Veberič, 2017). Vitamin C is important in a process of restoring other antioxidants, such as vitamin E. It protects leukocytes from being damaged by oxidation. Recommended daily allowance differs among different age groups. For children it is lower, for adults higher (Higdon, Drake, Angelo, et al., 2018).

The most energy consumed with berries comes from sugars, both glucose and fructose (Burton-Freeman, Sandhu and Edirisinghe, 2016), thus consumption of fruits (150–250g per day) should be lower than of vegetables (250–400g per day) (Hlastan Ribič, 2009).

Conclusions

Traditional slovenian breakfast is suitable for pupils in both macronutrient composition and energy intake. Eventhough it exeedes the guidelines for energy intake with snack (16% instead of 10–15%), we concluded pupils need energy for concentration during classes and physical education. For the same reasons we support breakfast being more abundant in carbohydrates and poor in fats as the guidelines instruct. Lower content of fats is beneficial from the view of type of fatty acids, since it contains mostly saturated fatty acids from butter and milk. We propose substitution of part of butter with walnuts, thus children would consume unsaturated fatty acids as well. We would like to emphasize it is also important that pupils recieve detailed instructions how much of each food they can consume, e.g. one tea spoon of honey.

The two projects are very different, but we found a connection. The connection is local food production. Looking from this perspective, those projects complement each other. The project Traditional slovenian breakfast is educating pupils why local food production is more environment friendly and why locally produced food has higher nutritional value, among other topics. Project 2°

Green roof allows the pupils to actually take care of plants grown on the green roof, thus in a way they are producing local food as well.

Thus we conducted, both projects carry a great potential in educating pupils and improving their eating habits, if there are certain additions made to them. Examples are our lecture we gave in three classes and a quiz. We suggest upgrading the projects with more interactive contents, such as different didactic games, lectures, quizes and other different didactic methods, thus pupils would be more effectively presented the purpose of balanced nutrition. School and local producers or farmers could cooperate and organize workshops together. Workshops could be held on school's green roof, where pupils could also meet the local producers or farmers and learn more about their work and food. Thus pupils could learn more about different crops and foods they might not have met with yet. Questionnaire results show pupils' eating habits are not suitable, hence we inferred their knowledge on nutrition is insufficient. Interractive contents would help them recognize new healthier methods of food preparation, more knowledge on building a healthy balanced plate and understanding the importance of drinking water instead of juice or soda, importance of reducing salt in the diet and importance of eating fruit and vegetables. Implementing such projects might be beneficial for their knowledge. By upgrading the projects, additional information would be provided and changes in eating habits would be encouraged.

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