Dietary recommendations and health-promoting food basket during pandemic crisis

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Summary
During the COVID-19 pandemic, It was necessary to ensure an optimal nutritional status of the human body and maintain a normal body weight. This can be achieved with a balanced diet, which covers all the necessary nutrients for the body in an appropriate amount with respect to age, sex, physiological state and physical activity according to the recommended dietary allowances (*RDA*). The goal of our work was to quantify the amount and composition of food in accordance with nutritional recommendations with an emphasis on crisis situations such as COVID-19 pandemic. Using the nutritional software Alimenta 4.3e (Food Research Institute, Bratislava, Slovakia), we compiled bi-weekly menus in accordance with *RDA* for four selected physiological groups that are most represented in the Slovak population. The recipes were also the basis for defining the amount of food needed for a period of 14 days, reflecting the length of the quarantine during the COVID-19 pandemic. The defined amounts of food for selected physiological groups can serve as health-promoting food basket, which has been absent for a long time in the Slovakia.

Keywords
recommended dietary allowance; food basket; food composition; COVID-19

The immune system protects the body from various pathogenic microorganisms (bacteria, viruses, fungi and parasites) through complex mechanisms involving specific cells and specific substances in the body. The immune system is active permanently and its activity increases during infection. A health-compatible diet is an important prerequisite for the proper functioning of the immune system. It should be noted that no particular nutrient, food or dietary supplement will boost immunity to such an extent as to fully protect from a highly infectious virus, such as SARS-CoV-2 [1]. Physical distancing and good hygiene are the best protection against COVID-19. Many documents emphasized the importance of adequate personal hygiene when handling food, highlighting the need for frequent handwashing with soap and water or alcohol-based hand sanitizers [2].

Many dietary compounds participate in the functioning of the immune system, while vitamins D, C, A (including beta-carotene), E, B6, B12, folic acid, zinc, copper, selenium, iron, amino acids, *n*-3 and *n*-6 polyunsaturated fatty acids as well as intestinal microbiota are crucial in various types of defence processes. The greatest attention is paid to vitamins D, C, A, zinc, selenium and *n*-3 polyunsaturated fatty acids, because they play important role in maintaining the integrity and function of the immune system, including proliferated immunity, reversing proliferated activity of cells and maintaining the stability of cell membranes. These key nutrients have been shown to be of particular importance in supporting the body's antimicrobial defence mechanisms, alleviating the symptoms of infection and reducing the risk of severe 'common' (i.e. non-COVID) respiratory infections [1]. Adequate intake of nutrients can be achieved through a balanced diet, which should include meat, fish, legumes, dairy products, nuts and seeds, eggs, fruit and vegetables (e.g. citrus fruits, cauliflower, broccoli, kiwi, spinach, sweet potatoes and carrots) [2].

In our study, we focused on the general population, which consume meat or is flexitarian. People following a vegetarian diet must make careful choices about what they eat to ensure that

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they meet the nutritional requirements of their organism. Vegetable sources may not contain complete proteins, so vegetarians should ensure they get enough of various types of proteins throughout the day. Some vegetarians may need supplements, mainly vitamin B12, vitamin D and iron, or eat foods fortified by these nutrients.

One of the most common recommendations for COVID-19 is to consume fruits, vegetables and whole grains. It is recommended to consume at least 5 servings of fruits and vegetables per day. A diet rich in fruits and vegetables contains large amounts of vitamins and minerals, including vitamins A, C, D, E and B, as well as zinc and selenium, which are important modulators of the immune system. In addition, fruits and vegetables are a good source of water, antioxidants and fibre, all of which play a role in the control of hypertension, diabetes and weight gain, which belong to the most important risk factors of COVID-19 complications [2].

According to dietary recommendations, general population should in particular avoid foods rich in sugars, salt and saturated fatty acids in order to reduce the risk of overweight, obesity, cardiovascular diseases, diabetes and certain types of cancer (e.g. colon cancer) [1]. Specific dietary recommendations encourage reduced consumption of sugar-sweetened beverages, to limit consumption of sweets as well as to reduce the portion sizes of meat and other products of animal origin in order to reduce the intake of saturated fats. It is recommended also to prefer dairy products with a reduced content of fat and inclusion of health-compatible fats in the diet, such as olive oil or fish oil. Excessive salt intake should be replaced with spices and herbs [2]. World Health Organization recommends eating fresh vegetables or fresh fruits for snacks instead of sweets or salty snacks [3].

Some organisations recommend buying unprocessed food instead of processed food. Dried, frozen or canned foods (e.g. fish, fruit, soups) are suggested as alternatives when fresh produce is not available. The current trend is to prepare meals at home using fresh ingredients instead of consuming processed foods or ready meals [2].

Dietary recommendations also regard the drinking regime. Water is essential for maintaining cellular homeostasis, kidney function, regulating body temperature, regulating mood, cognitive functions, heart function and digestion as well as preventing headache [2]. Sweetened fruit nectars, fruit juices, concentrates, syrups and fizzy drinks should be avoided due to their high content of sugars [3].

It is also possible to use nutritional supplements during the COVID-19 pandemic to achieve the recommended intake of nutrients. As mentioned above, some vitamins and minerals affect the function of the immune system, but the idea that more is better is a misconception [2]. The benefits of the nutrient intake for the human body are discussed when the intake is higher than the lower threshold intake (*LTI*) and at the same time is lower than the tolerable upper intake level (*UL*). *UL* represents the highest level of total long-term intake of a nutrient at which an individual from general population is not at risk. For some micronutrients (e. g. vitamin D, B6 or selenium) *UL* is set and that means that higher doses may have undesirable or toxic effects [4].

On the other hand, it must be said, that dietary reference intake (*RDI*) was set for healthy individuals, based on energy intake of 8 400 kJ per day. Health professionals can individually adjust nutrition plans, taking into account other factors (e.g. illness, medication use, vegetarianism, veganism or high physical activity) with regard to increased nutritional requirements. For this purpose, the range from the recommended dietary allowance (*RDA*) to *UL* can be used to optimize the dietary plan [2]. On the other hand, *RDA* is the daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97–98 %) healthy individuals in a particular lifestage and gender group.

There is no diet that will protect humans from the coronavirus infection. However, the course of the disease is to some extent influenced by the metabolic status of the host. A balanced diet ensures a balanced intake of nutrients that play a role in the immune system. Malnutrition, overweight and obesity are considered independent and prognostic risk factors for severe SARS-CoV-2 infection, which in severe disease reduce the patient's chances of survival. Therefore, ensuring good nutritional status, including adequate body weight, is a reasonable approach in the prevention of infection by SARS-CoV-2 or alleviating its course [1].

Development or elaboration of a health-promoting food basket (FB) for the population, or for its individual physiological groups, is one of the tools to ensure a balanced diet for the population. The health-promoting FB should be helpful for all household members. It can represent a supporting tool for living a healthy life in accordance with the recommended dietary allowances described in the national dietary guidelines. The amounts of nutrient should be carefully translated into food portions and consumption frequency if country-specific guidelines are expressed only in nutrients [5]. However, health-promoting FB in Slovakia

has not yet been established and therefore our goal was to define the quantity and composition of food to ensure adequate nutrition of the Slovak population with an emphasis on crisis situations such as the COVID-19 pandemic or the consequences of the war in Ukraine.

MATERIALS AND METHODS

The basic document for defining the nutritional needs for provision of nutrition of the Slovak population was the 9th revision of *RDA* from 2015 for the population in the Slovakia with emphasis on crisis situations such as the COVID-19 pandemic [6]. We decided to define the nutritional needs for four basic physiological groups of the population: female, male, children and elderly non-working female. We selected four major population groups based on data from the Statistical Office of the Slovak Republic [7]. The age and sex data from the Statistical Office of the Slovak Republic were split into the age categories defined in the *RDA*. Four largest population groups were selected from this distribution, namely 7–10 years children, 35–62 years females doing physically light work, 35–62 years males doing physically medium work and non-working 63–79 years females. Non-working female aged 63–79 years also represent a vulnerable group of the elderly population due to the higher risk of a more severe course of COVID-19. For female aged 35–62 years, we selected physically lightly working female taking into account a frequently curfew or home office, resulting in lower energy requirements and lower levels of physical activity. For male aged 35–62 years, we chose the category of physically medium work to cover the physically working part of the population.

For the selected 4 physiological groups, biweekly menus were designed in accordance with *RDA* reflecting the 14-day quarantine based on the pandemic measures. Menus were designed to primarily meet the requirements for essential nutrients, i.e. proteins, fat and carbohydrates, including dietary fibre. Secondly, we took into account the best possible fulfilment of the need for micronutrients (vitamins and minerals). For menu design, we considered Food and Agriculture Organization (FAO) nutrition advice for adults during the COVID-19 outbreak [3]. In the menu, we incorporated following advices: eat fruits and vegetables in an amount of at least 400 g per day; for snacks, prefer raw vegetables and fresh fruits rather than foods that are high in sugar, fat or salt; include wholegrain bread in the diet; eat high quality proteins from animal sources (e.g. meat, fish, eggs and milk) and vegetable sources (legumes, nuts and seeds). Variety of fruits and vegetables available in Central European climate was included in menus, such as apples, pears, plums, grapes, carrots, cabbage, tomatoes, paprika, cucumbers, pumpkins or beetroot. Sunflower oil was preferably used in recipes instead of animal fat high in saturated fats. Poultry or red meat as a main dish was planned 3–4 times a week and one fish dish a week was planned. Where possible, reduced-fat versions of milk and dairy products were chosen. Legumes were planned in the menu twice a week. Our target was to cover *RDA* for proteins, fat and carbohydrates in the menu every day. At the same time, the 14-day dietary model is a long enough period to minimize variation in dietary intake from day to day and thus to achieve the best possible fulfilment of *RDA*. Because the longer period we plan, the more we are able to ensure dietary diversity, which is a prerequisite for a balanced diet or an intake of individual nutrients, including vitamins and minerals. The raw materials and foodstuffs included in the menus were mainly locally sourced, i.e. foods that can be grown or produced in Slovakia or at least in our latitudes. We have deliberately not relied on imported foods and exotic types of food in our planning, the supply of which may be limited in the event of a pandemic crisis. Menus were prepared using the Alimenta 4.3e nutritional software (Food Research Institute, Bratislava, Slovakia), which also allows the evaluation of food composition in comparison with *RDA*. The software contains a food composition database of foods and dishes. This software can be used for calculation of chemical composition and energy value of food products, meals and dishes according to a given recipe and known composition of ingredients. The software recognizes the nutritional losses occurring during technological treatments or culinary preparation. Last but not least, Alimenta 4.3e provides recording and evaluation of individual or group nutrient intake for a given period of time (day, week, month, etc.). Portion sizes for each age group were based on the Material and Consumption Standards and Recipes for School Catering from 2018 [8]. Menus consisted of 5 meals per day. The main meal consisted of breakfast, lunch and supper. The remaining two meals were smaller snacks, mostly consisting of a serving of fresh fruits and/or vegetables. Occasionally, a soft pastry was included. No sweets, savoury snacks or alcoholic beverages were taken into account in the preparation of the menus. It was assumed that all meals would be prepared and consumed at home.

Raw foods and food products for preparing meals would be bought in the market. Drinks were not included in the menus.

In the next step, we created the so-called health-promoting FB, based on the recipes (the amounts of ingredients used for the preparation of the meals) and we quantified the amounts of basic food needed for the preparation of meals for a period of 14 days for the 4 selected physiological groups.

RESULTS AND DISCUSSION

Health-promoting food basket

Tab. 1 shows the health-promoting FB for 14 days for the 4 selected age groups separately. FB is based on model menus for 14 days that were designed in accordance with *RDA*. Tab. 2 shows an example of 1-day model menu for female 35–62 years old doing physically light work. FB is defined in Tab. 1 as a list of 40 staple foods or commodities. The foods or commodities are classified in the following categories: milk and dairy products; eggs; meat and meat products; fish and fish products; fruits, vegetables and their products; vegetable oils; pulses; nuts and seeds; cereals and cereal products; sugar; salt; and miscellaneous. Tab. 1 shows clear differences in the amounts of food for each age group. Obviously, the greatest nutritional needs are for a male aged 35–62 years doing physically medium work. A female aged 35–62 years doing physically light work has a slightly lower needs corresponding also to a female doing work from home during quarantine. A non-working female aged 63–79 years has a very similar food basket as a female aged 35–62 years for most commodities, except for milk, butter or cereals and cereal products, where the amount of food is slightly lower for a female aged 63–79 years. The smallest FB is for children aged 7–10 years. The exception for the 7–10 age group is milk and dairy products, where the amount of foods in FB is bigger compared to other age groups, due to the higher need for proteins for growth of children.

FB should enable for all household members to live healthy lives in accordance with *RDA* as described in the National dietary guidelines [5]. FB should be acceptable for people, yet maintaining the healthy effect on public health. Some guidelines may be too strict or too far away from what people in a certain society actually eat [5]. FB for different physiological groups is a practical tool in planning and ensuring adequate dietary intake in a population. Allows us to create food packages for various types of families according to age and gender and thus specifically ensure food supply in crisis situations.

There can be a difference between the actual food consumption of the population and the health-promoting FB, and it actually is. The COVID-19 pandemic induced behavioural changes in the population in terms of shopping and food consumption. More than a half of consumers in Slovakia changed their purchasing behaviour during the COVID-19 pandemic. The most common change was in the frequency of shopping, the change of several small purchases into one large purchase. Among other things, increased health awareness was reflected in food purchases during the pandemic. Consumers looked for fresh and suitable food for their particular lifestyle. There was an increase in the consumption of organic foods, local products and products from small retailers [9, 10]. Consumers were more likely to purchase frozen and long shelf-life foods during the pandemic [11].

A survey of the dietary habits of Slovaks during the COVID-19 pandemic showed that domestic isolation and lockdown led to a significant change in adult diets [12]. According to this survey, 13.7 % of respondents had an increase in dairy consumption and 14.9 % of respondents had the same increase in egg consumption. On the contrary, meat and meat products consumption was significantly lower in 22.0 % of respondents. Alcohol was consumed by 67.0 % of respondents, but much more men than women consumed alcohol (74.8 % vs 59.2 %). A positive finding was that consumption of fresh vegetables and fruits increased during the pandemic. A negative finding was that salt consumption also increased. Regarding the use of nutritional supplements during the pandemic, most respondents took vitamin D (57.9 %) and vitamin C (47.9 %). More than a third of consumers in Slovakia stocked up on food and drugstore goods to an increased extent, carrying out so-called panic shopping in the context of the COVID-19 pandemic and various restrictions on the movement of the population [9]. This behaviour was visible in several countries, when some goods, such as disinfectants, drapes or yeasts, became scarce [13].

FB can be modified according to the needs and availability of individual foods. In a crisis situation in the case of shortage of raw materials or a limited supply of raw materials, fresh food can be replaced with long shelf-life foods. For example, pasteurized milk can be replaced with UHT milk, fresh fruits and vegetables can be replaced with canned, frozen or dried fruits and vegetables, fresh meat could be replaced by canned meat or meat products. Meat can be also

Tab. 1. Food basket based on model menus for 4 selected physiological groups.

Essential foods	Amount of food per person for 14 days [g]			
	Children 7–10 years old	Female 35-62 years old, physically light work	Male 35-62 years old, physically medium work	Non-working female 63-79 years old
Milk and dairy products				
Milk (1.5% fat)	3133	1871	2524	1836
Fresh cheeses (cottage cheese...)	33	60	80	60
Hard and semi-hard cheeses, processed, matured	220	257	288	257
Acid milk products, including yoghurts	1300	750	750	750
Butter	284	255	306	221
Cream	55	63	71	63
Eggs (pieces)	6	5	7	5
Meat and meat products				
Meat fresh	548	630	720	630
Lean meat products	57	67	88	67
Fatty meat products	158	190	250	170
Pork lard/ bacon	57	65	75	65
Fish and fish products				
Fish fresh	90	120	120	120
Canned fish	8	11	12	11
Fruit, vegetables and their products				
Vegetables fresh	2381	3178	3478	3178
Canned vegetables	276	293	377	293
Ketchups and purees	43	59	98	59
Fruits fresh	3023	3612	4210	3312
Dried fruits	30	60	100	60
Child nutrition	160	170	200	170
Fruit jam	85	95	205	95
Fruit juice	410	410	410	410
Potatoes	1950	2456	2931	2456
Cereals and cereal products				
Rice	264	325	365	325
Wheat flour	840	862	1063	787
Oatmeal/breakfast cereals	163	56	106	36
Bread and pastry	1900	2390	3540	2200
Fine pastries	740	345	350	240
Durable pastries	232	84	119	29
Pasta	200	232	389	232
Legumes	83	98	118	98
Nuts and seeds	68	65	120	70
Vegetable oils	292	334	382	323
Salt	70	93	101	92
Sugar	213	214	233	183
Miscellaneous				
Honey	50	60	80	60
Baker's yeast	22	26	33	24
Cocoa	10	5	11	2
Vinegar	20	35	48	33
Mustard	21	32	52	32
Spices	8	10	17	10

replaced by legumes, e.g. beans or lentils, for a certain period of time. According to the results of a previous study that linked a plant-based diet and the course of COVID-19 [14], a plant-based diet and a pescatarian diet (a diet that is richer in vegetables, legumes, nuts and poorer in poultry, red meat and meat products) are dietary patterns considered to protect against this serious disease. An important feature of pescatarian diet is consumption of fish and other seafood. That study involved 2 884 health professionals from 6 countries (France, Germany, Italy, Spain, United Kingdom, USA) working in the frontline during the pandemic. Participants who reported consuming a plant-based or pescatarian diet were less likely to have a moderate to severe course of COVID-19, by 70 % for the plant-based diet and by 59 % for the pescatarian diet.

Tab. 2. 1-Day menu for female 35–62 years old doing physically light work.

Menu	Portion size [g]	Note
Butter	10	Breakfast
Wheat bread white	150	
Bilberry jam	20	
Apples	150	Snack
Tomato soup with rice	250	Lunch
Fish fillets roasted in butter	80	
Old potatoes, boiled	220	
Cucumber salad	80	
Walnuts	25	Snack
Pears	150	
Salami, pork and beef meat	20	Supper
Vegetable margarine fat 70% (w/w)	10	
Rye bread whole-meal	150	
Pepper (*Capsicum* green)	50	

Fulfilling the recommended dietary allowances with model menus

Using Alimenta 4.3e software, we evaluated how the designed menus covered the nutritional requirements for selected physiological group. The Alimenta 4.3e software allowed us to evaluate the menus against *RDA*. The results of the percentage fulfilment of *RDA* for selected macronutrients and micronutrients are presented in Tab. 3. *RDA* values for selected population groups are also a part of Tab. 3 for comparison.

RDA values are a practical approximation of mean values of nutritional factors around which some variability and tolerance is allowed. On average, variance is given in the range 7–15 % and in practice, for example for proteins +20 % difference is allowed while maintaining safe intake limits and macronutrient ratios [6]. Based on the results presented in Tab. 3, we can conclude that the proposed menus or recommended food consumption cover the essential macronutrients of proteins, fat and carbohydrates very well. The menus designed also meet the need for zinc, selenium, vitamins B1, B2, B6, B12, niacin and folic acid. Deficiency of zinc, selenium, vitamin C or vitamin D were shown to be several times more common in patients with a severe course of SARS-CoV-2 virus disease than in uninfected individuals or patients with a mild course of disease. More than 50 % of patients hospitalized for COVID-19 disease were malnourished. Malnourished patients, whether primary or secondary (due to illness, hospitalization or therapy), were shown to have a several-fold more severe course of infection and higher mortality from COVID-19. Obese patients were similar to those of malnourished patients, suggesting the need to maintain a balanced energy balance and normal body weight at all times to ensure adequate nutrient saturation of tissues [1].

The proposed menu had poor coverage of vitamin A, vitamin E and especially vitamin D. Vitamin D supports the normal function of the immune system. Adequate levels of vitamin D reduce the risk of severe disease and mortality from COVID-19 [15]. Naturally, vitamin D is mainly found in fish. However, fish consumption in Slovakia has long been at a low level, as shown by the unpublished results of the questionnaire conducted by the National Agricultural and Food Centre, Food Research Institute, Slovakia. The data collection was conducted between September and October 2022 and 168 respondents participated. The results of the survey confirmed a relatively low fish consumption, when only 6 % of respondents consume fish 2 or more times a week, 34 % consume fish once a week, 37 % consume fish once or twice a month, up to 19 % consume fish occasionally (several times a year) and 4 % do not consume fish at all. Because few foods contain vitamin D, physicians recommend its supplementation from the recommended daily intake to upper limit. An alternative to supplementation is to choose foods fortified with vitamin D. In recent years, vitamin D consumption in the form of dietary supplements increased. This was thanks to the information campaign, which included information that vitamin D supports the function of the immune system and that sufficient vitamin D levels reduce the risk of severe disease

Tab. 3. Recommended dietary allowances and percentage fulfilment of recommended dietary allowances of model menus for selected physiological groups in selected nutritionally important parameters.

	RDA				*RDA* fulfilment [%]			
	Children 7–10 years old	Female 35–62 years old, physically light work	Male 35–62 years old, physically medium work	Non-working female 63–79 years old	Children 7–10 years old	Female 35–62 years old, physically light work	Male 35–62 years old, physically medium work	Non-working female 63–79 years old
Proteins total	53 g	57 g	72 g	56 g	119 %	115 %	115 %	109 %
Fat total	78 g	72 g	92 g	68 g	100 %	101 %	99 %	101 %
Carbohydrates total	297 g	306 g	397 g	279 g	100 %	100 %	100 %	101 %
Dietary fibre	17 g	24 g	28 g	22 g	144 %	118 %	130 %	123 %
Zinc	7 mg	8 mg	12 mg	7 mg	189 %	182 %	144 %	198 %
Selenium	35 μg	60 μg	65 μg	60 μg	190 %	128 %	133 %	129 %
NaCl	2 g	5 g	5 g	5 g	181 %	185 %	264 %	178 %
Vitamin A1	400 μg	650 μg	900 μg	650 μg	56 %	35 %	29 %	33 %
Vitamin D	12 μg	15 μg	15 μg	15 μg	15 %	13 %	16 %	13 %
Vitamin E (tocopherols)	10 mg	14 mg	15 mg	14 mg	76 %	60 %	70 %	58 %
Vitamin B1	1 mg	1,1 mg	1,3 mg	1 mg	115 %	116 %	123 %	120 %
Vitamin B2	1,1 mg	1,3 mg	1,5 mg	1,2 mg	117 %	93 %	100 %	94 %
Vitamin PP	12 mg	13 mg	17 mg	13 mg	87 %	94 %	86 %	89 %
Folic acid	250 μg	400 μg	400 μg	400 μg	222 %	106 %	136 %	94 %
Vitamin B5	5 mg	5 mg	7 mg	5 mg	71 %	72 %	63 %	68 %
Vitamin B6 (pyridoxins)	1,2 mg	1,2 mg	1,5 mg	1,2 mg	102 %	107 %	103 %	103 %
Vitamin B12 (cobalamins)	1,8 μg	2,4 μg	2,5 μg	2,4 μg	120 %	100 %	99 %	97 %
Vitamin C	80 mg	95 mg	110 mg	100 mg	128 %	120 %	115 %	113 %
Energy value	8 800 kJ	8 800 kJ	11 300 kJ	8 200 kJ	98 %	96 %	96 %	96 %

RDA – recommended dietary allowance.

and mortality from COVID-19 [16]. The increased interest in taking vitamin D was also confirmed by a survey, which showed that during the COVID-19 pandemic in Slovakia, most respondents took vitamin D (57.9 %) and vitamin C (47.9 %) [13].

We conclude that values for vitamin A and vitamin E are underestimated, due to the missing food composition data about vitamin A and vitamin E in nutritional software Alimenta 4.3e used for the menu design. It is well known that vegetable oils are a good source of vitamin E. However, we missed data for vitamin E in sunflower oil used in model menus. According to FB for female, almost 24 g of vegetable oil per day are needed. According to Slovak Online Food Composition Database [17], sunflower oil would provide 12.1 mg of vitamin E per day, which represents 86.9 % of *RDA* for vitamin E.

Good sources of vitamin A are liver, fish, milk and milk products, butter and eggs. The low values for vitamin A may be caused by low fish consumption and also by limited data about vitamin A in the food composition database implemented in Alimenta 4.3e software. For the purpose of evaluation of diet models in Alimenta 4.3e software, detailed food composition data without missing values about vitamins and minerals are crucial.

One of the recommendations listed in *RDA* is the recommendation for the daily intake of table salt, which should be no more than 5 g per day for children aged 15 years, older children and adults. For younger children, this recommendation is in the range of 0.5 g to 2 g per day [6]. The evaluation of the menus showed that *RDA* for table salt was exceeded. The recommended daily intake of salt was exceeded by a factor of 1.8 for children and by a factor of 2.6 for men. Based on the results menu, recipes should be reviewed or a reduction in the amount of salt for preparing food should be proposed. Another alternative is to choose products with reduced salt content, for example in the categories of meat products and bakery products. The popular salty snacks were not included in the model menus. On this basis, our assumption was that the actual salt intake is likely to be much higher. Also, the results of the 2022 survey of Vadovičová [12] showed that salt consumption in the adult population increased during the COVID-19 pandemic.

The strong side of the proposed health-promoting FB is bringing the data about food needed for Slovak population in crisis situations and planning the food supply for specific population groups. The weak point of the proposed health-promoting FB is that we missed food consumption data in Slovakia, survey data, existing (qualitative and quantitative) studies and discussions in focus groups. For this reason, it was not possible to include actual food consumer trends in the menu design, e.g. include most popular dishes prepared at home. It is not easy to find a balance between the rational diet plan and the real one. Bigger working group from different areas of expertise would be useful in creating a health-promoting FB. On the other side, crisis situations usually bring limitations in the variety of food and the proposed FB can be helpful as a starting point. The other issue is that food composition data in Alimenta 4.3e software used for the menu design are not regularly updated. On the one hand, food composition data in software Alimenta 4.3e have empty spaces, such as limited data on vitamins in some food products, and on the second hand, food composition data of some new products are not involved, such as new types of bakery and cereal products or plant-based beverages. Software users may update the food composition data on their own, but this is a time-consuming process. For these reasons, fulfilment of *RDA* based on bi-weekly menus may be somewhat imprecise in particular for vitamins and minerals. However, improvement in this case may be difficult as the content of vitamins and minerals in foods is very variable.

CONCLUSIONS

Based on the general dietary recommendations during the COVID-19 pandemic and in accordance with *RDA* for the population of Slovakia, bi-weekly menus for four selected physiological groups were developed, namely, male, female, children and elderly non-working female. The menus were the basis for quantification of the amounts of staple foods and for the development of health-promoting FB for the four selected groups for crisis situations such as the COVID-19 pandemic. FB has been absent in Slovakia for a long time and therefore quantification of the amount of food for the preservation of health of the population is essential. FB is considered beneficial for ensuring food sufficiency in various crisis situations, including the consequences of the war in Ukraine, or for assessment of the food production potential of Slovakia.

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