Nutrition of children and adolescents with type 1 diabetes in the recommendations of the Mediterranean diet
Odżywianie dzieci i młodzieży z cukrzycą typu 1 w rekomendacjach diety śródziemnomorskiej

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Abstract

Introduction: The nutrition of children and adolescents significantly affects the physical and mental development of those suffering from type 1 diabetes and their healthy peers. Nutrition rules for children and adolescents with type 1 diabetes do not differ from the principles of feeding their healthy peers. Hence, the demand for individual nutrients in type 1 diabetes and healthy people is the same. The nutrition of children and adolescents should meet the recommendations of the Institute of Food and Nutrition and the Polish Diabetes Association.

Aim of the study is to present a pattern of nutrition for children and adolescents with type 1 diabetes, treated with intensive insulin therapy using the Mediterranean diet, which was recognised by the World Health Organization as a model of a healthy diet for both children and adults. Through the participation of a large number of natural products, it has antioxidant, chemopreventive, and anti-inflammatory effects, it reduces the level of triglycerides and cholesterol, as well as postprandial glycaemia.

Conclusions: Preparing meals according to the principles of rational nutrition and the guidelines of the Mediterranean diet allows maintenance of daily normal glycaemia and prevention of later metabolic disorders. Observance of diet principles ensures proper physical and mental development of the child and protects them against overweight and obesity.

Key words: type 1 diabetes, nutrition for children and adolescents, the Mediterranean diet, a plate of healthy eating.
Introduction

Nutrition rules for children and adolescents with type 1 diabetes do not differ from the principles of feeding their healthy peers. Hence, the demand for individual nutrients in type 1 diabetes and in healthy children is the same [1, 2].

Fat should be 30–40% for children up to three years old and 30-35% for children over three years of age, protein 15–20%, and carbohydrates (sugars) should not exceed 45–50% of the daily energy requirement, and both in healthy people and in those with type 1 diabetes they must be under control in the daily food ration. Due to the intense physical and mental development of children and adolescents, the appropriate amounts of nutrients, vitamins, and minerals in each meal should be taken into account [1, 2].

This paper presents the principles of nutrition for children and adolescents with type 1 diabetes based on the latest recommendations of the Polish Diabetes Association and the principles of the Mediterranean diet, which can be used by patients to prepare a healthy meal based on the “healthy eating plate” model.

Aim of the study

The aim of the study is to present the principles of nutrition for children and adolescents with type 1 diabetes, treated with intensive insulin therapy using the Mediterranean diet.

The principles of nutrition for children and adolescents with type 1 diabetes and their healthy peers

Proper nutrition is responsible for the proper physical and mental development of children and helps to protect them from overweight and obesity. According to Bremer and Nelson, overweight is one of the main risk factors for developing diet-related diseases [3–5]. Parents/guardians of the child play a major role in shaping the principles of rational nutrition. Among other things, they should: provide appropriate conditions during preparation and meal intake, present the right attitude by maintaining proper body weight, and engage in physical activity with the child [6]. Scaglioni et al. showed that parents’ eating habits significantly influence the dietary choices of their children [7]. An indispensable element in the treatment of type 1 diabetes, apart from intensive insulin therapy, is the diet [8]. The nutritional strategy of children and adolescents is based on balanced, healthy meals, in which an appropriate ratio of carbohydrates to proteins and fats should be maintained. According to experts’ recommendations, both a diabetic child and his/her healthy peer should eat 4–5 meals every 3–4 hours, including three main meals: breakfast, lunch, dinner and two snacks. Breakfast, which should be eaten up to 30 minutes after waking up, should account for 30% of daily energy; lunch 30–35%, supper eaten 2–3 hours before bedtime 25–30%, and snacks only 5–10% of daily energy demand [1, 2, 9]. All of the assumptions above are met by the Mediterranean diet [10–12].

Water

The importance of water is crucial in the context of human health and the proper functioning of human body. Systematic consumption of too little water in relation to the demand is visible and perceptible in a short time. It contributes to the weakening of the mechanism of removing toxins, disturbances of metabolic processes, and decrease of physical efficiency. Water should be supplied throughout the day in an amount consistent with the recommendations developed by the Institute of Food and Nutrition in Warsaw, which include both drinking water in its pure form and water from all types of beverages and water consumed with food. The quantities included in the standards apply to the average person in a given age group, staying in a room of moderate temperature [13, 14]. Flavoured waters and other colourful drinks are not recommended. In addition to the large amount of sugar, they contain numerous preservatives and colourants that may cause hyperactivity and concentration disorders in children, repeatedly confirmed by numerous studies [15]. McMann et al. showed a negative impact of six common drink colourants on the child’s nervous system [16]. According to the guidelines of the Mediterranean diet, water should be consumed with every meal, in an amount of about two litres a day, and juices and other coloured drinks should be very limited – which fully meets the aforementioned recommendations [12].

Carbohydrates

Carbohydrates – colloquially called “sugars” – should constitute 45–50% of the daily energy demand [2]. One gram of carbohydrates provides four kilocalories. Due to their structure, sugars are divided into simple and complex ones, and because of their digestibility they are classified as digestible and nondigestible (dietary fibre). The basic source of sugars should be complex carbohydrates (slowly absorbing), which, as American researchers have proven, should be obtained from minimally processed products with low or moderate glycaemic load1, and thus a low glycaemic index2, e.g. thick groats, rice, pasta, or cooked jacket potatoes [17, 18]. Particular attention should be paid to simple sugars, a fast but short-lasting injection of energy that cannot exceed 8–10% of the daily energy requirement. They can be found not only in sweets, but also in drinks, bread, boiled vegetables, and fruits [17–19].

Fruits supplement the daily diet with vitamins and minerals necessary for the proper functioning of the body. They also

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1 A way of assessing the carbohydrate content in 100 g of product, where 10 and less is a low glycaemic load, 11–19 is average, and 20 and more is a high glycaemic load.

2 Classification of products based on their effects on blood glucose levels approximately two hours after consuming a meal.
have healing properties. It is not without reason that fruits in accordance with the principles of the Mediterranean diet should belong to the basic products of this diet [10]. For example, studies by Zikri et al. show that anthocyanins contained in fruits provoke the process of cancer cell death in the oesophageal epithelium [20]. Similar conclusions were drawn by Wang, who pointed out the inhibition of oesophageal cancer development by black raspberries rich in anthocyanins [21, 22]. However, fruits represent a group of products belonging to rapidly absorbed carbohydrates; therefore, despite many advantages, they should not be eaten without control. According to the World Health Organization (WHO) and the Institute of Food and Nutrition, the daily portion of fruit should not exceed 300 g. The absorption of simple sugar can be slowed down by combining fruit with a standard-fat milk product, e.g. cottage cheese with raspberries. Recommended fruits (especially for diabetics), due to the small amount of sugar and high content of water and dietary fibre are berries, i.e. blueberries, raspberries, blackberries, and gooseberries [18, 23].

An extremely important carbohydrate is dietary fibre, which, regardless of the fraction (soluble or insoluble), contains 2 kcal in one gram [24]. Fibre plays an important role in the prevention of many diseases. Schoenaker et al. analysed the effect of dietary fibre intake on the occurrence of cardiovascular diseases in people with type 1 diabetes. In a seven-year study, there were 2100 participants between 15 and 60 years of age. It was noticed that an increase in fibre intake by only 5 g/day resulted in a decrease in mortality and morbidity among the respondents [25]. The sources of dietary fibre include raw or cooked al dente vegetables (which absolutely should be added to every meal), cereal products, fruits, and legume seeds. The Mediterranean diet is a diet rich in fibre, because the products mentioned above form the basis of this diet [10]. Fibre has many functions in the body, including: binding water and bile acids, increasing the mass of faeces, absorbing metals, lowering glucose, affecting the flow of nutrients through the intestines, and lowering cholesterol in blood [24]. Both the Polish and American Diabetes Society recommend increasing the amount of complex carbohydrates taken, including fibre. Increasing the content of dietary fibre contributes to the reduction of blood glucose fluctuations, consequently limiting the glycaemic response, which has been confirmed by numerous studies. Anderson et al. clearly proved in a systematic review that this thesis is true, analysing the results of 34 previous, randomised trials [26].

Proteins

The next nutrients are proteins that have building functions. Protein is used only to a small extent for the production of energy; however, in poorly treated diabetes, it can be used excessively, which is detrimental to health. The daily requirement for protein ranges between 15 and 20%, and its calorific value is the same as for carbohydrates and amounts to 4 kcal/g. We distinguish complete protein (found in animal products), which contains all the essential amino acids, and low-value protein (found in plants), which is deficient in at least one amino acid in the composition. In every main meal there should be a product containing a complete protein e.g. egg, cottage cheese, poultry, or fish (when prepared without batter, they meet one of the principles of healthy nutrition). It is also recommended to include legumes (lentils, beans, peas) in a weekly menu, which contain a comparatively similar quality protein as animal products. The Mediterranean diet meets these recommendations and promotes the consumption of fish, legumes, and white meat [10, 18, 27].

Fats

The most energetic component of the diet is fat, which in the daily energy demand should be 30–40%. Fat has the highest calorific value of nutrients and provides 9 kcal/g, but contrary to popular opinion it is not only a source of calories, but also essential vitamins such as: A, E, D, and K and essential fatty acids (EFA). Fats are also a source of ingredients for the construction of organs and tissues and for the synthesis of numerous biologically active substances, e.g. tissue hormones. There are saturated and unsaturated fats. Saturated fats are found in animal products such as eggs, meat, or dairy products, whereas unsaturated fats are found in plant products such as nuts, seeds, and vegetable oils. Oily fish are an exception because, despite the fact that they are not vegetable products, they contain omega 3 polyunsaturated fats. Unsaturated fats, depending on the number of double bonds, are divided into: monounsaturated fatty acids (MUFA), which should constitute 10–15% of the estimated energy requirement (EER)³ and polyunsaturated fatty acids (PUFA), which should be 6–10% of EER (including 1–2% omega 3 and 5–8% omega 6). Saturated fatty acids (SFA), not containing double bonds, should not constitute more than 10% of EER [27–29]. The Mediterranean diet is characterised by a high share of unsaturated fats, fulfilling another important assumption propagated in feeding children with type 1 diabetes, as well as their healthy peers [10]. Jakobsen et al. analysed 11 cohort studies and showed that replacing saturated fat (SFA) with polyunsaturated fats (PUFA) allows the maintenance of normal cholesterol levels in blood, which significantly reduces the risk of diabetes, atherosclerosis, or ischaemic heart disease. This was not observed when saturated fatty acids were replaced with monounsaturated fatty acids (MUFA) and carbohydrates [30]. Prophylaxis of cardiovascular diseases should be carried out from an early age; therefore, vegetable fats, i.e. rapeseed oil (which should account for 2/3 of the amount of fat delivered), are recommended in the children’s diet. From among animal fats 82% butter is recommended (in the amount advised for food rations), because, apart from the fact that it does not contain chemical components, it is easily digestible and is a very well absorbed animal fat [31].

³ Estimated Energy Requirement (EER) is the average dietary energy intake that is predicted to maintain energy balance in healthy, normal weight individuals of a defined age, gender, weight, height, and level of physical activity consistent with good health.
Dairy

Dairy is a group of animal products the ingredients of which are easily absorbed. Dairy products contain complete protein and fat. Dairy is rich, among others, in calcium, mineral salts, and vitamins such as A, B₁, B₂, B₁₂, and D. This group includes fermented products, such as buttermilk, kefir, yoghurts, all kinds of cottage cheese, and cream. The dairy representative is milk, which is the basis for the production of other dairy products. Milk is a very good source of calcium (300 mg of calcium in the glass), fat-soluble vitamins (A, D, E, K), as well as water-soluble vitamins, i.e. B₁, B₂, B₆, B₁₂, PP, biotin, pantothenic acid, or vitamin C [18, 32]. However, despite these advantages, attention should be paid to the fact that cow’s milk contains lactose (disaccharide), which, without the presence of dietary fibre, absorbs very quickly and affects glycaemia as a simple sugar, e.g. glucose [18]. Cow’s milk is also one of the most common allergens [33]. In a cohort study by Wood and et al. of 512 children aged 3–15 months, allergy to milk protein was confirmed in up to 293 children [34]. In the Mediterranean diet, milk is replaced with yogurt, buttermilk, kefir, and cottage cheese [10].

Highly processed products

Highly processed products are products that are impossible to produce at home; they are processed in food industry factories to extend freshness and speed up the process of their preparation. Such products usually contain health-unfavourable food additives, e.g. salt, sugar, fat, flavour enhancers, and preservatives. Food that has been properly processed is safer, free of microbes, and easier to digest [35, 36].

Taking care of the proper development of the child, meal preparation should be based on using good quality products, of standard fat, and without the addition of preservatives. Originally, the Mediterranean diet was based on such products [11]. Low-processed products have a low or medium glycaemic index, which for both diabetics and healthy people will contribute to reducing the 24-hour insulin requirement, decreasing appetite and achieving or maintaining normal body mass [18]. Snacks are a significant problem because for children they are usually sweet and highly processed. Children often consume them in large quantities, often replacing meals or shortening the recommended breaks between meals. According to Kolarzyk et al., among 250 surveyed children a large majority showed a high level of preference for sweets and fast food. Fruits and dairy products were much less preferred by children and were usually found in small amounts as an addition to processed food; however, fruit together with a standard fat milk product (e.g. natural yoghurt with an apple) is a good and healthy snack [37].

Chocolate is considered controversial among sweets. According to KPMG (2016), the average Pole eats about 4.5 kg a year. Milk chocolate belongs to the group of highly processed products; it contains saturated fatty acids, a large amount of white sugar, and often preservatives and colourants. The positive impact of milk chocolate on health is doubtful, in contrast to the impact of plain chocolate. Chocolate with a large amount of cocoa fat (over 70%), consumed in small amounts, has a positive effect on human health. It is rich in iron, calcium, magnesium, phosphorus, potassium, and vitamins A, E, and D, and the most desirable ingredient of chocolate found in cocoa beans – flavonoids. Flavonoids have antioxidant properties, improve brain function, stop the development of cancer cells, reduce appetite, and protect against solar radiation [38, 39]. Numerous studies confirm their impact on a significant reduction in the risk of developing civilisation diseases [40–42].

Mediterranean diet

Among experts in the field of dietetics, the Mediterranean diet, which in 2003 was recognised by the WHO as a model of a healthy diet for both children and adults, is highly appreciated. The diet, owing to the inclusion of a large number of natural products, has antioxidant, chemopreventive, and anti-inflammatory effects, and it decreases the level of triglycerides and cholesterol, as well as postprandial glycaemia. Thus, it prevents many diseases including atherosclerosis and some cancers [43–48]. In 2008, a systematic review by Sofi et al. considering the impact of the Mediterranean diet on broadly understood human health was published. Twelve studies were conducted for the analysis, carried out on a group of 1,574,299 people. Observations have shown that the use of the Mediterranean diet plays an important role in the prevention of civilisation diseases and reduces the risk of death [49]. Spanish scientists, as part of the PREDIMED study, also checked the influence of the Mediterranean diet on the human body. They proved that even in people at high risk of cardiovascular disease, the Mediterranean diet contributes to reducing the risk of coronary events by as much as 30% [50]. However, Zhong et al. and Cadario et al. proved that in children suffering from type 1 diabetes, the Mediterranean diet has a beneficial effect not only on the cardiovascular system and LDL and HDL cholesterol levels, but also on interprandial glycaemia [51, 52].

The basis of this diet is constituted by products with a low glycaemic index, which come from a full milking. The vegetables – especially green and raw, as well as legume seeds, which are the source of folic acid, zinc, magnesium, iron, and dietary fibre – also play an important role. Popular in the diet are berries: blueberries, blackberries, dried apricots. The diet assumes about 15 g of dietary fibre for every 1,000 kcal, which has a significant impact in the prevention of overweight, obesity, diabetes, and cardiovascular diseases. It is characterised by a high content of marine fish, i.e. salmon, mackerel, tuna, sole, pollock, and hake, which provide valuable docosahexaenoic acids (DHA) and eicosapentaenoic acids (EPA). The recommended amount of DHA and EPA is 1–2 g per day, while ALA (α-Linolenic acid) is 3 grams per day. Fish are recommended at least twice a week. Milk in this diet has been replaced by yogurt, kefir, buttermilk, and cottage cheese. Feta cheese, produced with 70% sheep’s milk and 30% goat’s milk, which can be used to prepare salads or as an addition to cream soup, is especially recommended. The diet recommends white meat (e.g. chicken, turkey, rabbit).
In addition, the characteristic feature of the diet is a small intake of animal fat (lard, butter, margarine), and a large share of vegetable fats. Olive oil contains essential fatty acids, antioxidants, and vitamin E; hence the Greeks consume for good reason about 50 millilitres a day, or about 26 litres of olive oil annually. García González et al. showed a significant relationship between the consumption of olive oil and the low incidence of civilisation diseases [10]. Other extremely important components of the diet are nuts and oilseeds, which are also a valuable source of essential fatty acids, vitamin E, and selenium, magnesium, and phosphorus. Studies show that regular consumption of nuts reduces the level of total cholesterol and LDL-cholesterol fraction; it also reduces the risk of heart attack, stroke, and death from cardiovascular causes [11]. The Mediterranean diet assumes a glass of water for each meal (around two litres daily), while both vegetable and fruit juices are very limited. Meals should be prepared with the use of the non-fat method. Salt should be limited to 5–6 g per day. Dishes should be prepared without the addition of salt (replaced with natural spices). Depending on the region, various natural spices are used to prepare dishes, e.g. rosemary, oregano, thyme, basil, or turmeric [12, 32, 43].

The healthy eating plate and food pyramid as graphic representations of the general principles of rational nutrition

The healthy eating plate

For easy preparation of Mediterranean diet meals, the model of a healthy eating plate developed by Harvard Medical School can be used. A healthy plate meets the principles of the Mediterranean diet. Taking into account the rules of adjustment of insulin therapy to the number of carbohydrates, proteins, and fats in a meal, regardless of whether it is based on carbohydrate exchange units (CE) and protein-fat exchange units (PFE), or kilocalories, meals are prepared in a similar way. When counting carbohydrate exchange units and protein-fat exchange units, one should remember that one PFE balances with two CE. While counting kilocalories, on the plate 50% of calories should be from protein and fat (maintaining the appropriate ratio of proteins to fat – 2 : 3) and 50% of calories from carbohydrates [53, 54].

The principle of a healthy plate is one of the simple methods of estimating portions and composing balanced meals, which have a positive effect not only on body weight, but also on glycaemia. On a plate of 25–26 cm diameter, half should be covered with raw or cooked al dente vegetables – preferably seasonal. In winter, frozen vegetables can be also used to prepare meals. According to the work of Gębczyński and Fika et al., this process, unlike other methods of food preservation, maintains a high nutritional value [55]. The other part of the plate should be divided in half. A quarter of the plate is the place for complete protein, preferably from poultry (turkey, chicken, eggs, cured meats), dairy products (kefir, buttermilk, cheese, and cottage cheese), or fish, which should be served on the plate 2–3 times a week because they are good source of omega 3 and omega 6. The last part of the plate is covered by complex carbohydrates such as large grain groats, wholegrain pasta, wholegrain bread, and boiled potatoes – preferably jacket potatoes (this method of preparation causes the least loss of valuable minerals and limits starch hydrolysis [56]). In this part there is also fruit (which is good combined with dairy products). The meal should start with raw vegetables, then the protein, and finally the sugars. Such a habit gives time for insulin injected under the skin (or endogenous – in a healthy person) to undergo the appropriate “mixing” of its activity with the absorption of glucose from the meal [18, 23].

Food pyramid

The first food pyramid was published by the United States Department of Agriculture (USDA) in 1992 to raise the awareness of American society about proper nutrition. The pyramid,
although modified, functions to this day. It is a simple image of the principles of rational nutrition, which reflects the principles of the Mediterranean diet and implements the WHO recommendation – “less sugar, salt, and fat, and more dietary fibre”. The nutrition pyramid depicts how much of each product should be consumed during the day. On top of it are those products that should be consumed in very small quantities and not too often. The most important thing is at the base of the pyramid. Scientists unanimously confirm the positive effect of physical activity on human health; hence it was placed at the very bottom of the pyramid, gaining the title of the most important. Sedentary lifestyle is an indirect or direct cause of death [57]. This is confirmed, for example, by research carried out in Canada on a group of over 17,000 people (aged 18–90 years) that has proven a significant increase in the risk of death in reference to the increase in time spent in a sitting position [58]. Immediately after physical activity, the most important products are vegetables (three servings) and fruit (one serving). Other products are cereal products, followed by dairy products. Higher in the pyramid are meat products and fish, and at the very top – oils [2, 59].

**Summary**

Preparing meals in accordance with the principles of rational nutrition and the guidelines of the Mediterranean diet allows daily normal glycemia to be maintained and later metabolic disorders to be prevented. Observing the principles of the diet provides the child with physical and mental well-being and protects against overweight and obesity. Daily use of the principles of a healthy plate and a Mediterranean diet by all family members together with a person suffering from diabetes is one of the most important conditions for its long-term success.

**References**

1. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2018. Stanisławsko Polskiego Towarzystwa Diabetologicznego. Diabetol Prakt 2018; 4: 1-94.
2. Jarosz M, Rychlik E, Stoś K, et al. Normy żywienia dla populacji Polski. Wyd. Instytut Żywności i Życzenia, Warszawa 2017.
3. Nelson A, Bremer A. Insulin resistance and metabolic syndrome in the pediatric population. Metab Syndr Relat Dis 2010; 8: 1-14.
4. Huang T, Sun S, Daniels S. Understanding the nature of metabolic syndrome components in children and they can and cannot do to predict adult disease. J Pediatr-Us 2009; 155: 13-14.
5. Joseph J, Svartberg J, Njolstad I, et al. Risk factors for type 2 diabetes in groups stratified according to metabolic syndrome: a 10-year follow-up of The Tromsø Study. Eur J Epidemiol 2011; 26: 117-124. doi: 10.1007/s10654-010-9540-7
6. Sygit K. Unhealthy dietary habits in population of 12–17-year-olds and their consequences. Med Rev 2015; 13: 344-357. doi: 10.15584/medrev.2015.4.2
7. Scaglioni S, Salvioni M, Galimberti C. Influence of parental attitudes in the development of children eating behavior. Br J Nutr 2008; 99 Suppl 1: S22-S25. doi: 10.1017/S0007114508892471.
8. Hołyńska A, Kucharska A, Sńska B, et al. Pozorn węży życia wojewódzkiej a sposób żywienia chorych na cukrzycę leczonych bezpośrednio. Pol Merkuriusz Lek 2015, 39: 292-294.
9. Wierzejewska R. Znaczenie prawidłowego żywienia dzieci w wieku przedszkolnym. Chrzewska J (ed.). Wyd. IZJ, Warszawa 2011; 7-13.
10. García-González D, Aparicio-Ruiz R, Aparicio R. Virgin olive oil - Chemical implications on quality and health. Eur J Lipid Sci Tech 2008; 110: 602-607. doi: https://doi.org/10.1002/ejlt.200700262
11. Li T, Brennan A, Wedick N, et al. Regular consumption of nuts is associated with a lower risk of cardiovascular disease in women with type 2 diabetes. J Nutr 2009; 139: 1333-1338. doi: 10.3945/jn.108.103622
12. Martínez-González M, Fuente-Arrillaga C, Nuñez-Cordoba J, et al. Adherence to Mediterranean diet and risk of developing diabetes: prospective cohort study. BMJ 2008; 336: 1348-1351. doi: 10.1136/bmj.39561.501007.BE
13. Scientific Opinion on Dietary Reference Values for water, EFSA Panel on Dietetic Products, Nutrition, and Allergies (NDA). EFSA Journal 2010; 8: 1459.
14. Gawęcki J, Brzozowska A. Woda w żywieniu i jej źródła. Wyd. Akademii Rolniczej im. Augusta Cieszkowskiego, Poznań 2008.
15. Krzyśko-Lupicka T, Kęciłlo M, Kęciłlo Ł. Barwniki w żywności a zdrowie konsumentów. Kosmos 2016; 65: 543-552.
16. McMann D, Barrett A, Cooper A, et al. Food additives and hyperactive behaviour in 3-year-old and 8/9-year-old children in the community: a randomized, double-blinded, placebo-controlled trial. Lancet 2007; 370: 1560-1567.
17. Sieradzki J. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2009. Stanisławsko Polskiego Towarzystwa Diabetologicznego. Diabetol Prakt 2009; 10: A.
18. Korzeniowska K, Jablecka A. Cukrzyca (część III). Dieta w cukrzy- cie. Farmacj Współczesna 2009; 2: 110-116.
19. Adamska E, Górska M. Indeks i ładunek glikemiczny diety. Prz Kar- diologii 2008; 3: 223-231.
20. Zikri N, Riedl K, Wang L, et al. Black raspberry components inhibit proliferation, induce apoptosis, and modulate gene expression in rat esophageal epithelial cells. Nutr Cancer 2009; 61: 816-826.
21. Wang L, Hecht S, Carmella S, et al. Anthocyanins in black raspberries prevent esophageal tumors in rats. Cancer Prev Res 2009; 2: 84-93.
22. God J, Tate P, Larcom L. Red raspberries have antioxidant effects that play a minor role in the killing of stomach and colon cancer cells. Nutr Res 2010; 30: 777-782.
23. Plocharski W, Markowski J, Groele B, et al. Owoce, warzywa i soki w zaleceniach żywieniowych – kontrowersje dotyczące spożyw- czo. Przegląd Farmaceutyczny i Owocowo-Warzywny 2016; 60: 7-8.
24. Bienkiewicz M, Bator E, Bronkowska M, Blonnik pokarmowy i jego znaczenie w profilaktyce zdrowotnej. Probl Hig Epidemiol 2015; 96: 57-63.
25. Schoenaker D, Toeller M, Chaturvedi N, et al. Dietary saturated fat and fiber and risk of cardiovascular disease and all-cause mortality among type 1 diabetic patients: The EURODIAB prospective compilations study. Diabetology 2012; 55: 2132-2141.

26. Anderson J, Randles K, Kendall C, et al. Carbohydrate and fiber recommendations for individuals with diabetes: a quantitative assessment and meta-analysis of the evidence. J Am Coll Nutr 2004; 23: 5-17.

27. Dobrzańska A, Charzewska J, Weker H, et al. Normy żywienia zdrowych dzieci w 1–3 roku życia – stanowisko Polskiej Grupy Ekspertów. Część II – Omówienie poszczególnych składników odżywczych. Pediatr Pol 2013; 88: 97-102.

28. Marciniak-Luksiak K. Rola i znaczenie kwasów tłuszczowych omega-3. Żyw Nauka Technol Jakość 2011; 6: 24-35.

29. Materac E, Marczyński Z, Bodek K. Rola kwasów tłuszczowych omega-3 i omega-6 w organizmie człowieka. Bromatol Chem Toksyk 2013; 2: 225-233.

30. Jakobsen M, O'Reilly E, Heitmann B, et al. Major types of dietary fat and risk of coronary heart disease: a pooled analysis of 11 cohort studies. Am J Clin Nutr 2009; 89: 1425-1432.

31. Socha J, Socha P, Weker H, et al. Żyżenie dzieci a zdrowie wczoraj, dziś i jutro. Pediatria Współczesna. Gastroenterologia, Hepatologia i Żywienie Dziecka 2010; 12: 34-37.

32. Stankiewicz J, Lange M. Mleczne napoje fermentowane w żywieństwie children in preschool age. Bromatol Chem Toksyk 2012; 2: 191-195.

33. Rowicka G, Strucińska M, Dyląg H. Lactose intolerance in children with abdominal pain – do we relatively often take this diagnosis into account? Journal of Pre-Clinical and Clinical Research 2010; 2: 191-195.

34. Wood R, Sicherer S, Vickery B, et al. The natural history of milk allergy in an observational cohort. J Allergy Clin Immun 2013: 131: 805-812.

35. Olędzki R. Substancje niebezpieczne w żywności wykazujące działanie rakotwórcze i mutagenne. Zagrożenia i problemy cywilizacyjne XXI w. – przegląd i badania. Lublin 2017; 30-42.

36. Chmielewska M, Tys J, Petkowicz J, et al. Żywność – po pierwsze, dzięki jej wartości w zapobieganiu nadwadze i otyłości, niektórym chorobom i przeciwdziałaniu raka, dziś i jutro. Pediatria Współczesna. Gastroenterologia, Hepatologia i Żywienie Dziecka 2010; 12: 34-37.

37. Jabłońska K, Majkowska L. Optymalizacja doboru doposiłkowej diety. Zrównoważone jedyne dla zdrowia. Ziemniak Polski 2006; 9.

38. Kolarzyk E, Janik A, Kwiatkowski J. Zwyczaje żywieniowe dzieci w wieku przedszkolnym. Probl Hig Epidemiol 2008; 18: 522-530.

39. Kozłowska A, Szostak-Węgierek D, Kwiecień J, et al. Primary prevention of cardiovascular disease with a Mediterranean diet pattern among Spanish Adults Attending a Medical Centre: nondiabetic subjects and type 1 and 2 diabetic patients. J Diabetes Res 2017; 2017: 5957821. doi: 10.1155/2017/5957821.

40. Sohi F, Cesari F, Abbate R, et al. Adherence to Mediterranean diet and health status: meta – analysis. BMJ 2008; 337: a1344. doi: 10.1136/bmj.a1344.

41. Estruch R, Ros E, Salas-Salvadó J. PREDIMED Study Investigators, et al., Primary prevention of cardiovascular disease with a Mediterranean diet. New Engl J Med 2013; 368: 1279-1290.

42. Cadario F, Prodam F, Pasqualicchio S, et al. Lipid profile and nutritional intake in children and adolescents with Type 1 diabetes: the SEARCH Nutrition Ancillary Study. Eur J Clin Nutr 2016; 70: 802-806.

43. Cooper A, Sebire S, Montgomery A, et al. Sedentary time, breaks in sedentary time and metabolic variables in people with newly diagnosed type 2 diabetes. Diabetol 2012; 55: 160-166.

44. Adkins Y, Kelley D. Mechanisms underlying the cardioprotective effects of omega-3 polyunsaturated fatty acids. J Nutr Biochem 2010; 21: 781-792.

45. Kołtuzko B, Beblo S, Demmelmaier H, et al. Does dietary DHA improve neural function in children? Observations in phenylketonuria. Prostaglandins Leukot Essent Fatty Acids 2009; 81: 159-164.

46. Granado-Casas M, Alcubierre N, Martin M, et al. Improved adherence to Mediterranean Diet in adults with type 1 diabetes mellitus. Eur J Nutr 2018; doi: 10.1007/s00394-018-1777-z

47. Fortin A, Rabasa-Lhoret R, Lemieux S, et al. Comparison of a Mediterranean to a low-fat diet intervention in adults with type 1 diabetes and metabolic syndrome: A 6-month randomized trial. Nutr Metab Cardiovasc Dis 2018; 28: 1275-1284. doi: 10.1016/j.numecd.2018.08.005.

48. Vidal-Perocho C, Tricás-Moreno J, Lucha-López A, et al. Adherence to Mediterranean diet pattern among Spanish Adults Attending a Medical Centre: nondiabetic subjects and type 1 and 2 diabetic patients. J Diabetes Res 2017; 2017: 5957821. doi: 10.1155/2017/5957821.

49. González-Vélez A, Rabasa-Lhoret R, Lemieux S, et al. Comparison of a Mediterranean to a low-fat diet intervention in adults with type 1 diabetes: the SEARCH Nutrition Ancillary Study. Eur J Clin Nutr 2016; 70: 802-806.

50. Cooper A, Sebire S, Montgomery A, et al. Sedentary time, breaks in sedentary time and metabolic variables in people with newly diagnosed type 2 diabetes. Diabetol 2012; 55: 589-599.

51. Inoue M, Iso H, Yamamoto S, et al. Daily total physical activity level and premature death in men and women: results from a large-scale population-based cohort study in Japan (JPHC study). Ann Epidemiol 2008; 18: 522-530.

52. Pawłowska-Góral K, Denewiu M, Kimsa-Dudek M. Czy nowa piramida zdrowego żywienia i aktywności fizycznej ograniczy występowanie chorób cywilizacyjnych? Choroby cywilizacyjne i społeczne XXI w. – przegląd i badania. Lublin 2016; 144-150.