

THE INFLUENCE OF THE PRESENCE OF CARBOHYDRATES IN THE DIET AND THE CONDITION OF THE SKIN

WIKTORIA JAKACKA¹, MAŁGORZATA KNAŚ-DAWIDZIUK²

¹Lomza University of Applied Sciences – student,

²Cosmetology Department, Lomza University of Applied Sciences

E-mail: mknas@al.edu.pl

Abstract

Carbohydrates, or sugars, are important elements of the diet because they provide cells with the energy needed to function. Their sources are fruits, vegetables, cereal products, milk and sweets. Consuming too much sugar in the diet can undoubtedly lead to diseases such as diabetes, being overweight or obesity. Carbohydrates consumed in the diet are one of the main nutrients, they provide approximately 75% of the energy requirement from food. Everyone would like their skin to always look good and have as few skin-related problems as possible. Many people do not realize how important the impact carbohydrates have on human skin.

The aim of this study was to assess the impact of carbohydrates consumed with food by students from the Lomza University of Applied Sciences on the condition of their skin.

80 students from the Lomza University of Applied Sciences were qualified for the study.

The following research methods were used:

1. an assessment of the subjects' body composition - performed using the InBody 770 Body Composition Analyzer,
2. an assessment of carbohydrate intake using a food diary completed by students - data prepared using the Diet 5 program,
3. diagnostic survey method using an original questionnaire, which was used to assess students' knowledge regarding the impact of food on the condition of the skin.

The obtained results were subjected to statistical analysis using non-parametric U-Mann-Whitney tests and Spearman correlation.

Conclusions

1. Students are quite aware of the principles of proper nutrition and most of them apply these principles in everyday life.
2. Students know and see that their carbohydrate-rich diet can affect their skin condition.

Key words: carbohydrates, diet, skin

DOI: 10.34668/PJAS.2023.9.2.01

Introduction

People have always faced basic challenges deciding what to eat to maintain young and healthy skin, how to define a healthy diet and what role diet plays in the aging process. The topic that is currently attracting the most attention is how to maintain healthy skin and delay skin aging. The skin is the basic barrier that protects the body against external factors. Skin aging is a complex biological process, referred to as chronological aging and photoaging, which is influenced by internal and external factors.

Proper nutrition is one of the most important factors determining the proper development and functioning of the human body. The type of food affects not only immunity and longevity, but also the quality of life. Thanks to the food consumed people's bodies can function. However, to maintain an optimal balance, one should also pay attention to the quality of

food. A well-balanced diet must be diverse, i.e. it must contain a full range of ingredients: carbohydrates, fats, proteins, vitamins and minerals. Eating should not just be a necessity, it can and should be a pleasure. Only then will one's physical and mental health be in good condition. When planning one's diet, one should also pay attention to the ingredients that provide minerals. They regulate the metabolism and the structure of organisms. They comprise enzymes, hormones and vitamins. They take part in digestion and excretion. They influence the functioning of the nervous system and the muscles [1].

The key to maintaining a healthy weight is eating a balanced diet, and this should become a habit. Due to these rules, people will be able to fully enjoy their health. A balanced diet is also responsible for mental health and reduces the symptoms of depression and anxiety, mainly due to the vitamins and minerals contained in vegetables and fruits. By providing the body with the right amount of nutrients, people will stay

young, energetic and strong longer for everyday activities. A balanced diet also replenishes energy through the appropriate selection of carbohydrates, fats and proteins, giving people the strength to function. A balanced diet prevents many diseases and improves people’s well-being, which translates into positive mental health [2]

Foods high in sugar are often low in other nutrients. It has been estimated that consuming more than 25% of energy in the form of added sugars is associated with low absorption of some vitamins (A, E, C, B6, B12, and folic acid) and minerals (calcium, magnesium, iron, and zinc) [3]. Cancer, especially pancreatic cancer, is on the list of serious risks caused by consuming too much sugar [4].

Carbohydrates found in food are divided into two types: free and processed. The main sources of carbohydrates are:

- cereals,
- fruits and vegetables and their juices,
- dairy products,
- honey,
- sweet products,
- starch (potatoes, seeds) [5, 6, 7, 8].

Glucose, known as "grape sugar", occurs naturally in its free state in fruits, vegetables, fruit and vegetable juices, as well as honey. The amount depends on the type and ripeness of the fruit and vegetables. It is easily fermented by yeast; therefore, it is used to produce alcohol [5, 6, 7, 8].

Fructose, in addition to its natural form in fruits and fruit juices, is also used industrially to produce sweet syrups. The advantage of syrup is its low production cost and the ability to obtain better physical properties of the product. For this reason, these syrups are very common in the confectionery industry for the production of cookies, candies, desserts, ice cream and sweetened drinks [5, 6, 7, 8].

Sucrose is obtained from beets and cane sugar and is found in food mainly as white sugar. It also occurs naturally in honey, fruits and some vegetables. Due to its ease of absorption and sensory values, it has been widely used in the confectionery and bakery, meat, dairy and fruit and vegetable industries [5, 6, 7, 8].

Starch affects the texture of food products. The main dietary sources of starch are grains and their products, as well as pulses, dried fruits, potatoes, cassava, sweet potatoes and squash [5, 6, 7, 8].

Lactose is a type of sugar naturally occurring in milk and dairy products [5, 6, 7, 8].

Objective of the work

The aim of this study was to assess the impact of carbohydrates consumed by students from the Lomza University of Applied Sciences on the condition of their skin.

Material and methods

80 students from Lomza University of Applied Sciences were qualified for the study.

Tab. I. Characteristics of the study group.

Sex	
Female	48
Male	32
Age of respondents (mean ± standard deviation)	23.6±4.3
Place of residence	
City	42
Village	36
Education	
Primary	3
Vocational	0
Secondary	42
Higher	33

The following research methods were used:

1. assessment of the subjects' body composition - performed using the InBody 770 body composition analyzer,
2. assessment of carbohydrate intake using a food diary completed by students - data prepared using the Diet 5 program,
3. diagnostic survey method using an original questionnaire, which was used to assess students' knowledge regarding the impact of food on the condition of the skin.

The obtained results were subjected to statistical analysis using non-parametric U-Mann-Whitney tests and Spearman correlation.

Results

Almost half of the respondents answered that they usually eat a balanced diet, but their diet contains too many random products, eaten quickly, and on the run. Only 25% of respondents indicated that they usually eat a balanced diet, avoid sweet and salty snacks, and try to eat vegetables and fruits every day. Unfortunately, 25% of respondents also indicated that they eat poorly and irregularly, their diet is not balanced, but they try to eat vegetables, fruits and low-processed products. The rest of the respondents answered that they eat poorly and eat too many highly processed, ready-to-eat products which are high in carbohydrates and fats. Only 5% of respondents eat properly, maintaining a balanced supply of nutrients (proteins, carbohydrates, and fats).

More than half of the respondents indicated that they drink from 1 to 1.5 litres of fluids a day, and almost 40% of respondents - more than 1.5 litres. Only 5% of respondents indicated that they drink less than a litre of fluids.

To the question: What foods do you choose for a snack between meals? over 32% of respondents answered that these are carbohydrate products, naturally rich in sugar (fruits and cereal snacks), 40% eat carbohydrate products, sweetened: sweets,

rolls, and sweet snacks, 32% of respondents eat salty snacks - chips, pretzels, and crisps, 45% dairy snacks - yogurts, cottage cheese, dairy and desserts, over 11% indicated other (e.g. all listed in the answers above). Almost 29% of respondents do not snack between meals.

To the question: What products are the main source of carbohydrates in your diet? 60% of respondents answered that grains (groats, pasta, bread), over 28% that they were potatoes, almost 24% indicated sweets and sweet snacks, and 17.5% consumed fruits. Only over 1% of respondents mentioned pulses.

To the question: Do you follow any special diet? over 96% of respondents answered no. Less than 3% of respondents answered yes.

To the question: How do you assess your health condition? over 61% of respondents answered that it was good, and over 28% that it was very good. Unfortunately, 10% of respondents answered that their health condition was poor.

To the question: Do the foods you eat affect the condition of your skin? 75% of respondents answered yes and 25% said no.

To the question: Do you undergo dermatological treatment? almost 99% of respondents answered that they do not, and 1% that they did.

To the question: Do you have psychological discomfort resulting from the condition of your skin? over 48% answered that definitely not, 30% that sometimes, and over 16% that very rarely. 2.5% of respondents answered that they very often and definitely did.

To the question: Do you struggle with skin problems? 65% of respondents answered yes, the rest said no.

To the question: If so, what skin problems do you struggle with? (you can select multiple answers)? 17.5% of respondents answered that they had discolorations. As many as 20% of students have blackheads, 12.5% have acne, 7.5% have dilated capillaries, and 5% have enlarged pores.

To the question: Will only a proper diet reduce the discomfort associated with the condition of your skin? 45% of respondents answered yes, and 55% said no.

To the question: Will proper care and prevention as well as a proper diet help reduce the discomfort associated with the condition of your skin? over 61% of respondents answered yes, and less than 39% said no.

	Mean	Standard deviation	Minimum	Maximum
BMI	23.38	4.53	16.1	37
Basal metabolic rate	1417.04	244.27	1051	2152

In the study group, there was no correlation between the amount of carbohydrates in the diet and the mass of fat tissue in the subjects' bodies, their muscle mass, body BMI or basal metabolic rate.

Discussion and discussion of the results

With rapid medical breakthroughs in extending human life and the rapid deterioration of environmental conditions, it has become urgent to find safe and effective treatments for skin aging. Regarding diet, as the body's main way of obtaining energy and nutrients, people have gradually realized its importance for the skin. Therefore, new types of diets and the influence of nutrients on skin aging are being sought from the perspective of food and nutrition [9].

In this study, only 5% of respondents eat properly, maintaining a balanced supply of nutrients (proteins, carbohydrates, and fats). Almost half of the respondents usually eat properly, but their diet contains too many random products, eaten quickly, and on the run. Almost 25% of respondents usually eat properly, avoid sweet and salty snacks, and try to eat vegetables and fruit every day. Unfortunately, as many as 25% of the surveyed students eat poorly and irregularly, their diet is unbalanced, they eat too many highly processed, ready-to-eat products, rich in carbohydrates and fats, but some try to eat vegetables, fruits and low-processed products. Fortunately, according to the recommendations of the World Health Organization, 95% of respondents drink from 1 to 1.5 litres or more of fluids a day. It is very bad that 40% of respondents eat carbohydrates, sweetened products: sweets, rolls, and sweet snacks. The fact that almost 29% of respondents do not eat between meals is positive. All the above data prove that students are quite aware of the principles of proper nutrition and that most students apply these principles in their everyday lives.

People qualified for the study knew very well what products constitute the main source of carbohydrates in their diet. 60% of respondents answered grains (groats, pasta, bread), over 28% - potatoes, and almost 24% - unfortunately, sweets and sweet snacks. Only 17.5% of respondents use fruit.

Almost none of the respondents follow a special diet, and over 89% of respondents believe that their health is at least good. Unfortunately, 10% of respondents answered that their health condition was poor. 75% of respondents answered that the food they eat affects the condition of their skin, but only 1% of respondents undergo dermatological treatment. 65% of the surveyed students struggle with skin problems, but only 5% of them very often feel psychological discomfort related to their skin condition. Most often, these are discolorations, problems with blackheads, acne, dilated capillaries and enlarged pores.

45% of respondents believe that only a proper diet will reduce the discomfort associated with the condition, and over 61% of respondents believe that both proper care, prevention and a proper diet are needed to make them feel better about their skin condition.

In the study group, there was no correlation between the amount of carbohydrates in the diet and the mass of fat tissue in the subjects' bodies, their muscle mass, body BMI or basal metabolic rate.

Carbohydrates are a large and diverse group of organic compounds consisting of polyhydric aldehydes, ketones and their derivatives. Biologically, they are the basic energy matter of the cell, the storage material, and are the building blocks of the shape and mechanical properties of plant and animal cells. Carbohydrates

are also cell identifiers, an example of this would be blood group antigens. Plants can synthesize simple sugars through photosynthesis using carbon dioxide and water, while other organisms obtain carbohydrates from food [10]. They are used not only in the food, confectionery, textile and packaging industries, for the production of biodegradable packaging and films but also in cosmetology, pharmacy and medicine. The cosmetics industry uses saccharides as active raw materials, and they contribute to improving the condition and function of the skin and regulate the correct viscosity, stability and consistency of products. Sugars are divided into two groups: aldoses - i.e. polyhydric aldehydes, and ketoses - i.e. polyhydric ketones. Aldehydes with 3, 4, 5 or 6 carbon atoms in the molecule are: triose, tetrose, pentose, hexose. The basic names of ketones with 4, 5, 6 or 7 atoms are: tetulose, pentulose, hexulose, heptulose. A monosaccharide is an optically active compound that can be divided into two chains D and L, starting from the corresponding enantiomers of glyceraldehyde. Complex sugars consisting of two (disaccharides) or more simple sugar units linked by glycosidic bonds (oligosaccharides and polysaccharides). In addition to the compounds mentioned above, there is a very large group of compounds derived from carbohydrates. These include deoxysaccharides - carbohydrates in which the molecule is missing an oxygen atom because the -OH group is replaced by a hydrogen atom. On the contrary, in the amino sugar molecule, one of the -OH groups is replaced by the -NH₂ group. Before considering the possible uses of sugar in the cosmetics industry, it is necessary to systematize some of the concepts that characterize them [11, 12]. Glucose, also called grape sugar, is obtained by the hydrolysis of starch. It is part of the natural moisturizing factor, necessary for good skin hydration. This compound is used in hair care products because it prevents drying and split ends. Glycosaminoglycans are heteropolysaccharides composed of repeating disaccharide units consisting of an N-ethylated hexosamine moiety and hexuronic acid radicals [11]. There are seven types of glycosaminoglycans: chondroitin sulfate and chondroitin-6 sulfate, dermatan sulfate, keratan sulfate, heparan sulfate, heparin and the most popular in cosmetics - hyaluronic acid [12].

To sum up, the basis of a healthy diet is the proper selection of nutritional values. According to the principles of the food pyramid, fully digestible proteins, fats and carbohydrates, eating food rich in vitamins and minerals is a guarantee of health, and such nutrition affects the quality of people's lives. It should also be remembered that a balanced diet with an appropriate calorie content corresponding to energy demand helps control body weight and thus prevent the problems of being overweight and obesity, as well as being underweight [2, 13]. A balanced diet is the key to the proper functioning of the human body, and a good selection of cosmetics to prolong the youthfulness of the skin.

Conclusions

1. Students are quite aware of the principles of proper nutrition and most of them apply these principles in everyday life.
2. Students know and see that their carbohydrate-rich diet can affect their skin condition.

Literature

- [1] Turlejska H. Rola żywienia w życiu człowieka. *Żywność Żywnie Prawo a Zdrowie* 2020, 09 (2): 218-24.
- [2] Pilis A., Pilis K., Pilis W. Wpływ rodzaju stosowanej diety i aktywności ruchowej na masę ciała i funkcjonowanie organizmu. 2012, 11: 133-50.
- [3] Kavey R-EW. How sweet it is: sugar-sweetened beverage consumption, obesity, and cardiovascular risk in childhood. *J Am Diet Assoc* 2010, 110, 10: 1456-1460.
- [4] Larsson SC, Bergkvist L, Wolk A. Consumption of sugar and sugar-sweetened foods and the risk of pancreatic cancer in a prospective study. *Am J Clin Nutr* 2006, 84(5): 1171-6.
- [5] Gugąła-Mirosz S. Indeks glikemiczny – niski, średni, wysoki – który lepszy? <https://ncez.pzh.gov.pl/abc-zywienia/indeks-glikemiczny-niski-sredni-wysoki-ktory-lepszy/> (28.10.2023)
- [6] Foster-Powell K, Holt S, Brand-Miller J. International table of glycemic index and glycemic load values: 2002. *Am. J. Clin. Nutr* 2002, 76, 1:5-56.
- [7] Jarosz M, Sajór I, Gugąła-Mirosz S, Nagel P. Węglowodany, [w:] Normy żywienia dla populacji Polski, [red.] M. Jarosz, Warszawa, Instytut Żywności i Żywienia, 2017: 98-114
- [8] Kunachowicz H, Nadolna I, Przygoda B, Iwanow K. Jem zdrowo. Węglowodany, indeks glikemiczny i inne składniki odżywcze, Warszawa, Wyd. Lek. PZWL, 2011.
- [9] Cao C, Xiao Z, Wu Y, Ge C. Diet and Skin Aging-From the Perspective of Food Nutrition. *Nutrients*. 2020 Mar 24;12(3):870.
- [10] Balcerczyk A. Biologia. Repetytorium dla maturzystów i kandydatów na wyższe uczelnie, WSiP, Warszawa 2008.
- [11] Suffleta A. Mazur-Zielińska H. Glikozaminoglikany, budowa, właściwości biochemiczne i znaczenie kliniczne, *Ann. Acad. Med. Siles*. 2010, 64, 5-6:64-68.
- [12] Praca zbiorowa pod red. G. Schroeder: Nanotechnologia, kosmetyki, chemia supramolekularna, Cursivia 2014 http://www.supra.home.amu.edu.pl/files/monographs/nanotechnologia_kosmetyki_chemia_supramolekularna.pdf (data pobrania 28.10.2023)
- [13] Praca zbiorowa pod red. G. Schroeder: Nanotechnologia, kosmetyki, chemia supramolekularna, Cursivia 2014 http://www.supra.home.amu.edu.pl/files/monographs/nanotechnologia_kosmetyki_chemia_supramolekularna.pdf (data pobrania 28.10.2023)

Received: 2023

Accepted: 2023