

Dietary recommendations during the COVID-19 pandemic. Statement of the Committee of Human Nutrition Science of the Polish Academy of Sciences

COVID-19 pandemic and general dietary recommendations

During the COVID-19 pandemic, care must be taken to achieve and maintain optimal nutritional status of the body, including a normal body weight, by providing with the diet all the nutrients needed by the body in amounts appropriate to the age, sex, physiological condition and physical activity, in accordance with the dietary standards, if the individual needs of the body are not known.

The general principle of balanced nutrition is to consume a varied diet based on available foods. A key nutritional strategy for supporting the body and immune system functions should be a diet containing an adequate amount of water, a high proportion of plant-based foods (vegetables, fruit, whole-grain cereal products, legumes, nuts, and seeds), and an adequate amount of foods of animal origin (fish, dairy products, eggs and meat products).

Every day, a variety of fresh and non-processed or minimally processed food products that provide vitamins, nutrients, dietary fibre, protein, polyunsaturated *n-3* and *n-6* fatty acids and antioxidant components (e.g. polyphenols, carotenoids) should be consumed. Sugar, salt and saturated fatty acids to significantly reduce the risk of overweight, obesity, cardiovascular diseases, diabetes and certain types of cancer should be avoided.

General dietary recommendations during the COVID-19 pandemic ([Annex 1](#))

1. Ensure that the energy value of the diet is adjusted to the current level of physical activity
2. Vegetables and fruit should make up a half of the food you eat each day
3. Maintain adequate hydration of the body
4. Make reasonable food choices
5. Reducing sugar, salt and fat intake
6. Avoid drinking alcoholic beverages
7. Follow the principles of hygiene and safe food handling
8. Consume home-cooked meals in company as a method of stress relief
9. Ensure regular physical activity
10. Use dietary supplementation if the diet fails to meet the body's requirements
11. Use reliable sources of nutrition information

The COVID-19 pandemic and dietary recommendations for children

During the COVID-19 pandemic, children and adolescents are subject to the same nutritional requirements as adults and the periods of their growth and development, in which potential malnutrition can have long-term health consequences, are considered to be crucial. It is therefore important to provide the growing body with an adequate amount of all nutrients, with particular emphasis on vitamin D.

For infants up to six months of age, exclusive breastfeeding should be promoted as optimal to their health and development. To date, no presence of replicating SARS-CoV-2 has been demonstrated in breast milk,

while protective antibodies have been found in it. SARS-CoV-2 virus infection confirmed in a mother is not a contraindication for breastfeeding the child. However, since recommendations on breastfeeding in the context of SARS-CoV-2 virus infection may change as new data become available, it is important to check them regularly, e.g. on the website of the Polish Neonatal Society (www.neonatologia.edu.pl).

As new food products are introduced to a young child's daily diet, it is essential to offer a variety of fresh and non-processed or minimum processed food to provide water, all nutrients and dietary fibre in amounts appropriate to the child's age and needs.

A particular problem of Polish children at various ages is the constant increase in the prevalence of obesity, which may continue to rise, particularly during the pandemic due to less physical activity resulting from online learning, extended time spent in front of a computer screen and the restrictions on movement and social interactions. Therefore, for the sake of physical, mental and social health, it is essential to promote daily physical activity within the limits permitted by epidemiological regulations.

Dietary recommendations for children during the COVID-19 pandemic ([Annex 2](#))

1. Breastfeeding
2. Make sure to drink enough water every day
3. Ensure regular physical activity
4. Provide fresh and unprocessed or low-processed foods
5. Provide fats of adequate quality
6. Reduce salt and sugar intake
7. Prepare home-cooked meals
8. Use psychosocial support and help from specialists

Justification

The global pandemic linked to the infection with SARS-CoV-2 virus has changed all aspects of everyday life, as it has brought about a change in the dietary behaviour and lifestyle for most people, accompanied by an increase in stress experienced due to isolation, drastically reduced social interactions and concerns about contracting the virus, and the loss of employment and income. Proper nutrition is important to maintain health and, during the COVID-19 pandemic, taking care to follow a proper diet which is well adapted to the body's needs and the current physical activity level, becomes particularly important.

Sources of information on nutrition and infection with the SARS-CoV-2 virus

Identification of nutritional factors associated with a mild, moderate, and severe course of infection with the SARS-CoV-2 virus is the starting point for the development of "good nutritional practices" and the formulation of principles of the prevention and treatment of the infection. There is no doubt that the world has been taken by surprise by the scale of the pandemic and its consequences for human health and lives. Experts soon became expected to indicate methods for treating the infection and preventing its consequences. However, gathering strong scientific evidence (from randomised experimental studies) takes time, and it is difficult to obtain it within the timeframe of the pandemic.

The dietary recommendations have been developed through modifying the existing, well-documented dietary recommendations and adapting them to the changes in Poles' diets and lifestyles observed during the COVID-19 pandemics and are also based on the following:

- knowledge of physiology and pathophysiology concerning the effects of food and nutrition on the nutritional status of the body and its functioning, including the functions of the immune system.
- evidence gathered prior to the pandemic for other respiratory diseases (e.g. pneumonia) and other viruses (e.g. influenza A and B virus),

- knowledge derived from few experimental studies conducted during the pandemic, usually single-centre studies with small sample sizes, or observational studies that are less powerful in explaining the correlations between the diet, SARS-CoV-2 virus infection, the course of infection and mortality; several major experimental studies in this field are underway, but their results and conclusions have yet to be published.

Changes in the diet and lifestyle during the COVID-19 pandemic

The available study results show that in Poland, during the three initial months of the pandemic, many adults increased their food intake (34%) and the time spent in front of a screen (49%), while reducing their physical activity (43%). This resulted in an increase in the prevalence of overweight, and in the near future, it may trigger a further increase in the rates of obesity and many of its co-morbidities, e.g. cardiovascular diseases, diabetes and other metabolic diseases and certain types of cancer. However, some adults have reduced their food intake (14%), including those with previously normal or too low body weight, thus increasing the problem of the prevalence of underweight, malnutrition and anorectic behaviour.

Such changes in food consumption and lifestyle must be considered a major hazard to public health, especially in the context of overweight and obesity. Before the pandemic, 4-5% of children aged 2-6 years, 8% of girls and 14% of boys of school age were obese (data from the National Health Programme for 2017-2020). Moreover, depending on the age, 4-28% of adults or the elderly were obese (data from the European Health Interview Survey, 2014, according to the Central Statistical Office, 2020) and two to three times as many Poles were overweight.

The diet, nutritional status and immunity of the body

The foods we eat and the ingredients they contain determine the body's nutritional status and can affect its ability to prevent and combat infections and promote recovery. Food is a source of approx. 70 nutrients (e.g. amino acids, polyunsaturated fatty acids, glucose, vitamins, and minerals) and many biologically active components (e.g. polyphenols with antioxidant properties) but also anti-nutrients (e.g. phytates, oxalates, and ascorbic acid oxidase, i.e. an enzyme that breaks down ascorbic acid) or even harmful contaminants (e.g. arsenic or benzo[a]pyrene), which together are responsible for the body's health status. Good nutritional status (adequate saturation of tissues with nutrients) is essential for maintaining health and for the proper functioning of all systems and organs of the body, including the immune system.

The immune system protects the body against pathogens (bacteria, viruses, fungi, and parasites) through complex mechanisms in which a variety of specialised cells and regulatory substances are involved. The immune system is active at all times and its activity increases during infection. Increased activity of the immune system is accompanied by an increased metabolic rate and higher consumption of energy and substrates needed for the synthesis of substances and cells involved in defence processes.

Many components derived from the diet are involved in the functioning of the immune system, with the special role in a variety of defence processes served by vitamins D, C and A (including beta-carotene), E, B6, B12, folic acid, minerals: zinc, copper, selenium, and iron, amino acids and polyunsaturated *n-3* and *n-6* fatty acids. The most attention is given to vitamins D, C, and A and to zinc, selenium and polyunsaturated *n-3* fatty acids, as they play a crucial role in maintaining the integrity and functions of the immune system, including the activation, differentiation and proliferation of immune cells and in maintaining the stability of cell membranes as the immune response of the body is determined by their interaction at many stages of this process. These key nutrients have been demonstrated to be of particular importance in supporting the anti-viral and anti-bacterial defence mechanisms of the body, alleviating infection symptoms and reducing the risk of a severe course of "regular" (i.e. non-covid) respiratory infections. On this basis, their beneficial effect on the course of SARS-CoV-2 virus infection can be predicted and the ongoing clinical trials will help explain the role of nutrients in the treatment of this viral infection. Currently, a discussion is underway on the possibility of the therapeutic use of vitamins C, D and A, as well as zinc and polyunsaturated *n-3*

fatty acids, in amounts not exceeding the upper permitted intake levels (including the components derived from the diet) as a low-cost, pharmacological way to potentially help prevent infection with the SARS-CoV-2 virus or reduce its effects.

It is also the bacteria and other microorganisms found in the large intestine of humans (the so-called intestinal microbiota) that serve an important role in regulating immune system functions. The presence of a large number of probiotic microorganisms (e.g. *Bifidobacterium*, *Lactobacillus*) has a beneficial effect on many functions in the intestine and the whole body, including through the formation of a physical and chemical barrier that protects the large intestine against colonisation by pathogenic microorganisms and the probable strengthening of the body's innate immunity. Diet is one of the major factors determining the composition of the intestinal microbiota. A disturbed composition of the intestinal microbiota (dysbiosis) is seen in people with a high intake of animal-based foods and a low intake of plant-based foods. Conversely, a favourable composition of the intestinal microbiota is found in people who eat more plant-based foods, including those regularly consuming prebiotic foods that contain short-chain oligosaccharides (e.g. onion, garlic, legumes, whole-grain cereal products from oats or wheat) and fermented foods containing lactic acid bacteria (e.g. yoghurt, kefir, acidophilus milk and fermented vegetables). Two systematic reviews with meta-analysis have recently confirmed that probiotic microorganisms in adults enhanced the body's immune response to seasonal influenza vaccination. Moreover, a disturbed composition of the intestinal microbiota (dysbiosis) has been demonstrated in patients with a severe course of infection with the SARS-CoV-2 virus.

At present, there is no evidence that the foods consumed and the ingredients they contain, including those with pro- and prebiotic properties, serve an important role in preventing infection with the SARS-CoV-2 virus and alleviating its course. However, **taking into account the nutritional value of foods and the prevention of dysbiosis, recommending a diversified diet containing a high proportion of plant-based foods and an appropriate amount of animal-based foods has a solid scientific foundation.**

Malnutrition, obesity and infection with the SARS-CoV-2 virus

Nutritional deficiencies (overt or hidden malnutrition), generalised or relating to single components (e.g. vitamins C and D, B-group vitamins, zinc, selenium, iron, protein), reduce the body's immunity and can therefore increase the risk of falling ill and worsen the course of several diseases. Thus, it is logical that any weakening of the immune system's defensive function, including malnutrition, is conducive to infection with the SARS-CoV-2 virus. On the contrary, a balanced diet that fully covers the human body's requirement for all nutrients can support the functioning of the immune system, including in the course of infection with the SARS-CoV-2 virus.

This view is supported by the results of observational studies. It was found that deficiencies of zinc, selenium and vitamin C or D were several times more common in patients with a severe course of infection with the SARS-CoV-2 virus than in non-infected individuals or patients with a mild course of infection with this virus. Almost 50% of patients hospitalised for COVID-19 infection were malnourished. Furthermore, in patients with general malnutrition, primary or secondary (resulting from a disease, hospitalisation or therapy applied), a more severe course of infection and higher mortality due to COVID-19 have been demonstrated. An analogous observation concerned underweight or obese patients, which indicates the need to maintain a sustainable energy balance and a normal body weight regardless of the need for adequate saturation of the tissues with nutrients. Experts of the European Society for Clinical Nutrition and Metabolism (ESPEN) published (in 2020) their position containing an unequivocal recommendation stating that the prevention, diagnosis and treatment of malnutrition should be routinely applied in the treatment of patients with COVID-19 and that elderly patients and those with multiple other diseases should be given special care to ensure their good nutritional status.

Obesity is considered an independent and prognostic risk factor for a severe course of infection with the SARS-CoV-2 virus, which reduces a patient's chances of survival. Coexistent malnutrition may be a cause

of poor prognosis for obese people, as excessive body fat does not exclude the occurrence of nutrient deficiencies, particularly in people with an ill-balanced diet or those who have repeatedly followed fashionable but harmful weight-loss diets. Obesity and infection with the SARS-CoV-2 virus share some similarities, as they exacerbate inflammatory processes in the body, which may take a particularly drastic course in infection with this virus. In a severe course of the SARS-CoV-2 virus infection, a critical response of the body occurs, referred to as the “cytokine storm”, resulting from the activation of specific defence cells (macrophages) found in greater numbers in the adipose tissue. Such a scenario has been described in the infection with the H1N1 influenza virus and is currently being considered for the infection with the SARS-CoV-2 virus.

Irrespective of the results of future research, **avoiding overweight and obesity should undoubtedly be considered a reasonable approach in the prevention of infection with the SARS-CoV-2 virus and alleviating its course.**

Food, its ingredients and infection with the SARS-CoV-2 virus

In many products that are documented to be historically consumed by humans and have been used in traditional medicine, the presence of substances with anti-inflammatory, anti-fungal, anti-bacterial or anti-viral properties was demonstrated, e.g. vitamin C in fruits/juice of raspberries or elderberries, hesperidin, kaempferol and methylglyoxal in bee honey, allicin in garlic and onions, gingerols in ginger, curcumin in turmeric, piperine in pepper, etc.

There is, however, no strong scientific evidence, let alone systematic literature reviews with meta-analysis, indicating that specific foods (including herbs, herbal infusions and spices) or specific food ingredients with anti-viral, anti-bacterial, and anti-inflammatory properties, or dietary supplements are responsible for the prevention, alleviation of symptoms or treatment of the SARS-CoV-2 virus infection, including the severe covid pneumonia, acute respiratory syndrome, the “cytokine storm”, blood clotting disorders and organ failure leading to death. **Currently, such a correlation is considered to be potential and is a valuable hypothesis** that requires evidence from the highest-quality experimental studies and awaits a quantitative summary in systematic literature reviews with meta-analysis.

In view of the above and of the likely health benefits, despite the lack of strong evidence, there is currently **no justification for advising against the consumption of foods containing substances with anti-inflammatory, anti-bacterial or anti-viral properties.** However, daily or frequent consumption of these foods should not lead to drastic changes in the diet composition and to worsening of the diet balance due to having excluded other foods containing crucial nutrients.

Therefore, the previously developed nutritional recommendations referring to the general population and population groups with special needs remain valid. Given that children, adolescents, the elderly and pregnant or breastfeeding women are at greater risk of nutrient deficiencies and the resulting adverse health effects, ensuring the good nutritional status of these population groups is a reasonable approach in the prevention of infection with the SARS-CoV-2 virus.

The above position has been adopted unanimously.

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