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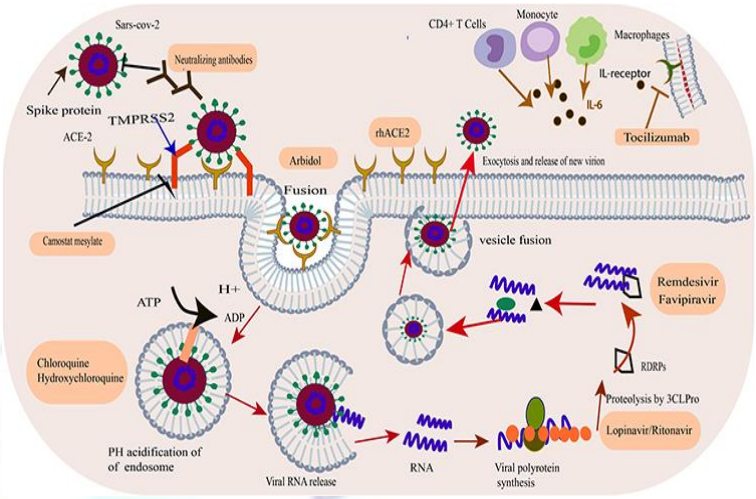
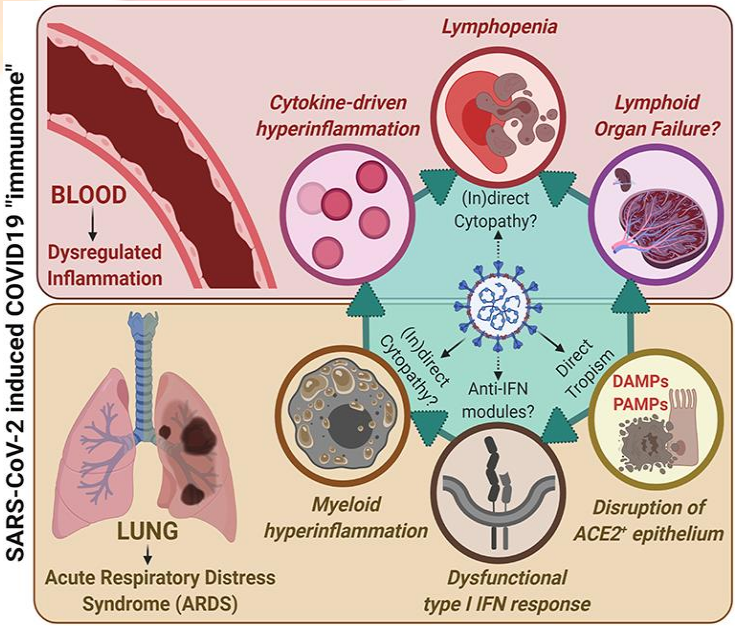
COVID-19

Etiology and pathophysiology of COVID-19

In December 2019, there was an outbreak of pneumonia of unknown cause in Wuhan, Hubei Province, China, which affected more than 60 people on the twentieth of that month. By January, the first cases of coronavirus disease 2019 (COVID-19) had been reported outside China: two in Thailand and one in Japan. Then, the rapid spread of the disease prompted the WHO to declare it as a health emergency of international concern. In March, the disease was already in more than 100 territories worldwide and recognized as a pandemic by the WHO. At present, the number of confirmed cases continues to grow. The virus that produced COVID-19 is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), an enveloped positive-sense RNA virus that mainly affects the respiratory system, being the spread of droplets generated by an infected subject the main route of transmission. When SARS-CoV-2 binds angiotensin-converting enzyme 2 (ACE2) receptors in the alveolar epithelial cells, the immune system responds through inflammation-related manifestation as well as antigen-presenting cell recruitment .The disease can be asymptomatic or present mild affection of the upper respiratory tract, while in the most severe cases is characterized by acute respiratory distress syndrome, heart failure, and septic shock .Moreover, as the disease advances, multi-organ failure has also been reported as the result of uncontrolled acute inflammation. Indeed, the immune response against the virus triggered by this uncontrolled inflammation results in pulmonary tissue damage, which in turn reduces lung capacity. The tissue damage produced by SARS-CoV-2 at the alveolar level is characterized by pathological changes of the tissue, infiltration, and hyperplasia. Besides respiratory failure, other features have also been described as common in critically ill patients of COVID-19, among them infiltration of immune cells into lung injuries, high levels of inflammatory response, thrombosis, and multi-organ failure recognized as a pandemic by the WHO.





Nutritional aspects of COVID-19 Patients

The influence of nutrients and bioactive molecules present in foodstuffs on immune system activity, the influence of COVID-19 on the nutritional status of the patients, and the dietary recommendations for hospitalized patients are addressed. There is limited knowledge regarding the nutritional support during hospital stay of COVID-19 patients. However, nutritional therapy appears as first-line treatment and should be implemented into standard practice. Optimal intake of all nutrients, mainly those playing crucial roles in immune system, should be assured through a diverse and well-balanced diet. Nevertheless, in order to reduce the risk and consequences of infections, the intakes for some micronutrients may exceed the recommended dietary allowances since infections and other stressors.

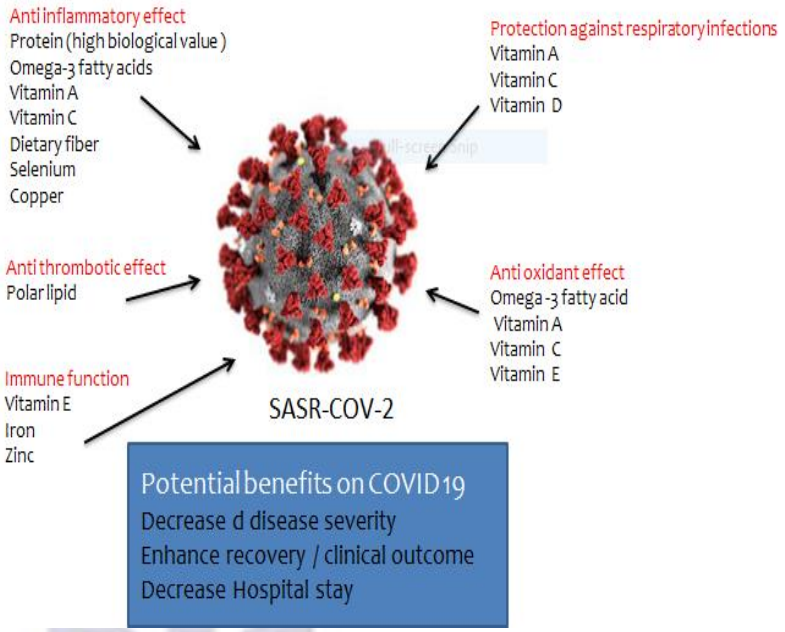
Protein

Protein deficiency is linked to impaired immune system function, mainly due to its negative effects on both, the amount of functional immunoglobulin and gut-associated lymphoid tissue (GALT). Besides quantity, the quality of proteins is also an important factor regarding the relationship of this macronutrient with immune system. In this line, it has been highlighted that including proteins of high biological value (those present in eggs, lean meat, fish, and dairy) containing all the essential amino acids may exert an anti-inflammatory effect. In addition, some amino acids, such as arginine and glutamine are well known for their ability to modulate the immune system.

Lipid

lipids, the omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) can inactivate enveloped viruses by modulating the optimal host lipid conditions for viral replication. On the other hand, EPA and DHA inhibit cyclooxygenase enzymes (COX) and, thus, may help suppressing prostaglandin (pro-inflammatory) production .Moreover, they are enzymatically converted to pro-resolving mediators (SPMs), such as protectins, resolvins, and maresins, alleviating inflammation .According to these effects, the supplementation with DHA and EPA may be useful to reduce the severity and/or improve the recovery of patients with COVID-19. On the other hand, polar lipids, such as phospholipids, glycolipids or sphingolipids (also present in food sources of omega 3fatty acids, such as fish and fish oils) have the ability to block platelet-activating factor (PAF) as well as its receptor, exerting anti-inflammatory effects that may be beneficial in COVID-19. Moreover, it has also been described that these lipid species can also down-regulate the enzymes involved in PAF biosynthesis, as well as up-regulate those involved on its degradation. The blockage of platelet activation may also be useful to prevent the thrombotic complications associated to COVID-19.Considering the evidence that MFO that (maximal fat oxidation) is a regulator factor of lipid metabolism, it could be expected that inactivity related to

a sedentary lifestyle decreased the MFO. Even if quarantine in the fight against COVID-19 currently a necessity to avoid contagion, inactivity related to the COVID-19 pandemic will increase the metabolic risk of confined people, aggravating the accumulation of fat mass, insulin resistance, and metabolic syndrome in coming months.



Carbohydrates

Carbohydrates and dietary fiber have also been reported to be related to immune system function. As far as carbohydrates is concerned, the consumption of those with higher glycemic indexes (highly processed carbohydrates) can result in mitochondrial overload and subsequent free radical synthesis. Indeed, increased circulating levels of inflammatory cytokines such as C reactive protein (CRP), tumor necrosis factor alpha (TNF-_), and interleukin-6 (IL-6) have been reported with the consumption of these kind of carbohydrates. Due to the inflammatory status that usually occurs in respiratory infections such as COVID-19, limiting the consumption of foods rich in these carbohydrates may be advisable.

Dietary fiber

Regarding fiber, its importance for a correct metabolic functioning has been widely reported. Several studies have revealed that an adequate fiber intake (25–35 g/day) may help reducing both, systemic and gut inflammation. Indeed, the consumption of foods that are source of fiber has been related to lower levels of inflammatory cytokines (CRP, TNF-_, and IL-6), as well as enhanced levels of short chain fatty acids (SCFAs) . In this regard, it has been described that different SCFAs (acetate, propionate, and butyrate) have a direct anti-inflammatory effect by inhibiting the release of pro-inflammatory molecules and by decreasing the expression of nuclear factor kB (NF-kB). Moreover, SCFAs also play an important role in the maintenance of an adequate gut micro biota by increasing the diversity, as well as enhancing the presence of specific health-associated bacteria. Besides gut micro biota, nasopharyngeal micro biota may also be involved in respiratory infections. Indeed, it has been reported that this kind of infections may result in altered gut micro biota and innate immune system response. Considering that COVID-19 has been related to respiratory and gastrointestinal symptoms, it seems plausible that gut micro biota impairment may occur, which in turn can result in an enhanced inflammatory status.

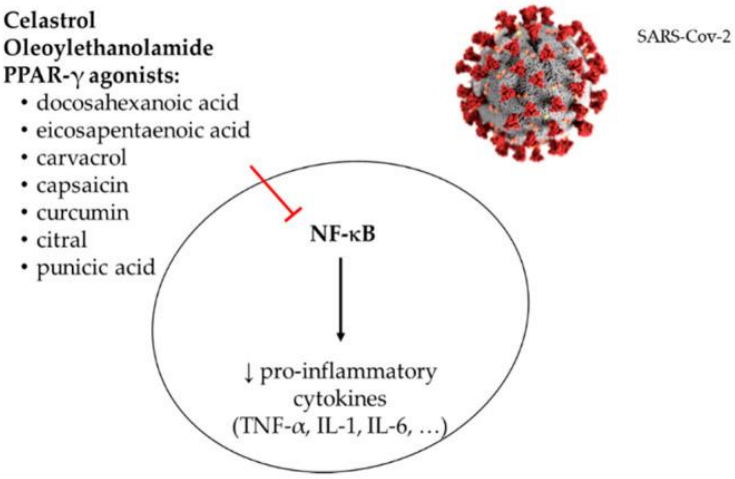
Vitamin

Vitamins A, C, D, E, B6, B12, and folate, iron, magnesium and trace elements including zinc, selenium and copper play a pivotal role in disease susceptibility and the maintenance of immune function. Deficiencies and/or inadequate status in these nutrients may negatively affect immune system, resulting in decreased resistance against infections.

- ✓ Supplementation with vitamins, minerals, and probiotics does not treat or prevent COVID-19 infection, but it can optimize the immune response, acting as an adjunct treatment.
- ✓ For individuals at risk of respiratory viral infections, high doses of vitamin C (up to 2 g/d) orally can be indicated.
- ✓ In groups at risk or with low sun exposure, vitamin D between 2000 and 4000 IU/d orally may be indicated.
- ✓ Maximal zinc intake should not exceed 40 mg/d.
- ✓ Higher doses of selenium (200 µg) can act as adjunct therapy in the treatment of infections but cannot be used for an extended period.

Natural bioactive

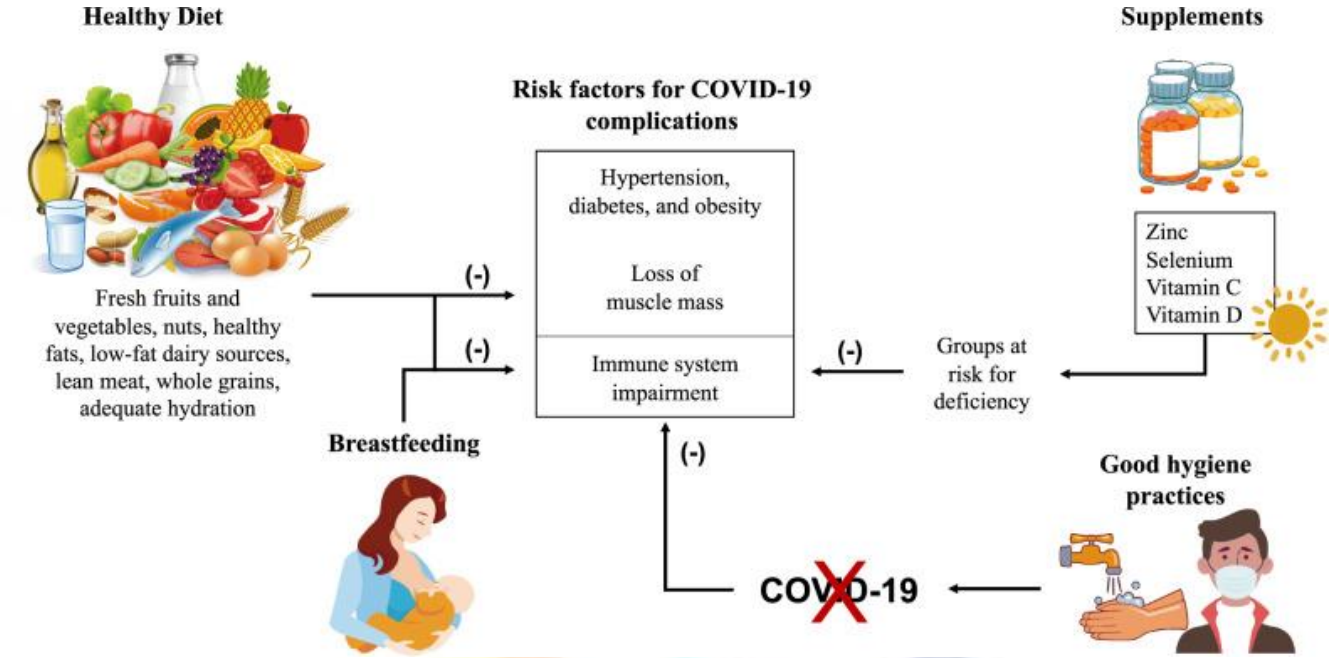
It has been found that several natural bioactive compounds interact with ACE2 receptor, which is the gateway for SARS and SARS-CoV-2, and thus regulates the viral infection. Natural bioactive compounds can also reduce the inflammatory response induced by SARS-CoV-2 infection. Taking into account that a great number of the patients with COVID-19 present "pro-inflammatory cytokine storm", which drive to a worse prognosis, these molecules could represent a promising target for immunomodulatory therapies. The potential benefits of resveratrol (3,5,4′-trihydroxy-trans-stilbene), celastrol, oleoylethanolamide, and natural peroxisome proliferator-activated receptor γ (PPAR-γ) agonists are described. Nevertheless, it should be pointed out that the vast majority of these result have been obtained in animal models, not confirmed in human.



Malnutrition

malnutrition is associated with immune dysfunction and thus it is likely to assume that this condition could make individuals more vulnerable to the viral infection .On the other hand, nutritional status can be negatively affected by the SARS-CoV-2 itself, as well as by the applied treatments. Hospitalized patients with COVID-19 tend to present malnutrition at the time of hospitalization. Chronic diseases that are commonly present in patients with COVID-19 (mainly diabetes, chronic obstructive pulmonary disease, renal insufficiency, cardiovascular diseases or dementia), as well as other risk factors such as socio-economic status or frailty, have negative effects on the nutritional status of these patients. In addition, during hospital stay, the prolonged immobilization, mainly in long stays in intensive care units (ICU), leads to muscle mass losses,

making the recovery of these subjects harder. Furthermore, the need for assisted breathing during prolonged periods also contributes to the development of sarcopenia and malnutrition.
This deteriorated nutritional status seems to be involved in the virulence of the virus, and probably in the clinical outcome.



In this regard, studies conducted in Italy have demonstrated the importance of maintaining/recovering an adequate nutritional status in the clinical outcomes of the patients. Due to fluid administration and rapid wasting of lean tissues, weight and BMI changes do not accurately reflect malnutrition in COVID-19 patients. Thus, the loss of lean body mass is of more concern than that of the BMI. Indeed, loss of muscle and sarcopenia have to be detected, since the larger the muscle mass decrease is, the more severe the malnutrition will be .Malnutrition is probably due to anorexia, nausea, vomiting, and diarrhea (which impair food intake and absorption), hypoalbuminemia, hypermetabolism, and excessive nitrogen loss .These effects are clearly associated with the increase in pro-inflammatory cytokines observed in these patients. Moreover, anorexia can also be related to dysgeusia. conducted a study devoted to analyzing the effect of COVID-19 infection on gustatory disorders, which was characterized by impairment of salty, sweet, bitter, and sour tastes.

Nutritional protocol for COVID-19 patients

The general recommendation for COVID-19 patients is to follow healthy diets to maintain a correct immune function. Optimal intake of all nutrients, mainly those that play crucial roles in immune system, should be assured through a diverse and well-balanced diet. However, current data suggest that there is a prevalent micronutrient and omega-3 fatty acid deficiency in several population groups On the other hand, in the review reported by Calder et al. based on several meta-analysis the authors state that in order to promote the optimum functioning of the immune

system and to reduce the risk and consequences of infections, the intakes for some micronutrients may exceed the recommended dietary allowances since infections and other stressors can reduce micronutrient status. Thus, supplements may help restoring their normal blood levels With regard to supplementation, it is important to advise the general public to always consult a medical doctor prior consuming such products, as they can interact with other nutrients, drugs, and medical treatments; indeed, they can turn into toxic elements causing several disorders and aggravating certain conditions.

3-step nutritional protocol

3-step nutritional protocol has been designed:

- ✓ The first step of this protocol would be focused on the nutritional assessment and malnutrition screening of the patient. For this purpose, different anthropometric parameters, as well as the body composition of the patients are studied. Further, the weight loss is monitored and a hematochemical analysis of blood parameters (including, among others, blood count, total protein, ferritin, blood sugar and markers of liver function) carried out. Finally, the swallowing capacity of the patients (in order to determine whether a specific diet is needed) is evaluated and their intake assessment monitored.

- ✓ A second step devoted to setting the nutritional treatment of the patient takes place. In this regard, the energy and macronutrient requirements of the patient are assessed, using the meal management computerized system of the hospital. In this scenario, energy requirements are calculated using predictive equations, which are adapted to the nutritional status of the patients (clinical status, physical1.5 g/kg/day) is guaranteed, as well as carbohydrate and lipid requirements established based on the non-protein energy (30:70 in patients with no respiratory insufficiency and 50:50 in patients with respiratory insufficiency). In addition, maintaining an adequate hydration of the patient is another aspect of the intervention that must be taken into account. In this regard, the clinical history of the patient (heart or renal failure, vomiting or diarrhea) must be analyzed. Moreover, additional supportive therapy (adequate vitamin and oligoelement intake, essential and branched amino acids and probiotics) is also provided. Similarly, nutritional advice that can be useful for the patient (while in the hospital as well as once they are discharged) is provided.

- ✓ As far as the third step is concerned, this is based in continuous monitoring of the patient by a multidisciplinary team over time, which allows modifying the treatment according to the status of the patient.

Recommended healthy lifestyle

Therefore, the responsibility of the individuals during the COVID-19 pandemic lies in making an effort to choose a healthy lifestyle:

- ✓ Eat diets high in fruits and vegetables, a variety of fresh and unprocessed foods every day to get the vitamins, minerals, dietary fiber, protein and antioxidants your body needs .

- ✓ Eat fruits, vegetables, legumes (e.g. lentils, beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat, brown rice or starchy tubers or roots such as potato, yam, taro or cassava), and foods from animal sources (e.g. meat, fish, eggs and milk).
- ✓ Daily, eat: 2 cups of fruit (4 servings), 2.5 cups of vegetables (5 servings), 180 g of grains, and 160 g of meat and beans (red meat can be eaten 1–2 times per week, and poultry 2–3 times per week).
- ✓ For snacks, choose raw vegetables and fresh fruit rather than foods that are high in sugar, fat or salt.
- ✓ Eat moderate amounts of fat and oil Consume unsaturated fats (e.g. found in fish, avocado, nuts, olive oil, soy, canola, sunflower and corn oils) rather than saturated fats (e.g. found in fatty meat, butter, coconut oil, cream, cheese, ghee and lard).
- ✓ Choose white meat (e.g. poultry) and fish, which are generally low in fat, rather than red meat.
- ✓ Avoid processed meats because they are high in fat and salt. Where possible, opt for low-fat or reduced-fat versions of milk and dairy products.

- ✓ Avoid industrially produced trans fats. These are often found in processed food, fast food, snack food, fried food, frozen pizza, pies, cookies, margarines and spreads.
- ✓ Eat less salt and sugar.
- ✓ When cooking and preparing food, limit the amount of salt and high-sodium condiments (e.g. soy sauce and fish sauce).
- ✓ Limit your daily salt intake to less than 5 g (approximately 1 teaspoon), and use iodized salt.
- ✓ Avoid foods (e.g. snacks) that are high in salt and sugar.
- ✓ Limit your intake of soft drinks or sodas and other drinks that are high in sugar (e.g. fruit juices, fruit juice concentrates and syrups, flavored milks and yogurt drinks).
- ✓ Choose fresh fruits instead of sweet snacks such as cookies, cakes and chocolate.
- ✓ Eat at home to reduce your rate of contact with other people and lower your chance of being exposed to COVID-19.

- ✓ Do not overcook vegetables and fruit as this can lead to the loss of important vitamins. When using canned or dried vegetables and fruit
- ✓ be careful not to consume too much caffeine, and avoid sweetened fruit juices, syrups, fruit juice concentrates, fizzy and still drinks as they all contain sugar.
- ✓ Drink enough water every day. Water is essential for life. It transports nutrients and compounds in blood, regulates your body temperature, gets rid of waste, and lubricates and cushions joints.
- ✓ Drink 8–10 cups of water every day
- ✓ Avoid sugar, fat and salt to significantly lower your risk of overweight, obesity, heart disease, stroke, diabetes and certain types of cancer.
- ✓ Exercise during free time, try to maintain a healthy weight, and
- ✓ Get an adequate amount of sleep.
- ✓ In addition to taking care of one's dietary intake the collective responsibility of individuals is to avoid the spread of misinformation related to nutrition and dietary intake, and the COVID-19.
- ✓ Since the outbreak, networks of social media were flooded by messages of single foods/herbs promising cure or prevention of the infection. The effects of such unfounded claims could lead to negative implications ranging from giving a false sense of protection against the infection to toxicity.

Counseling and psychosocial support

While proper nutrition and hydration improve health and immunity, they are not magic bullets. People living with chronic illnesses who have suspected or confirmed COVID-19 may need support with their mental health and diet to ensure they keep in good health. Seek counseling and psychosocial support from appropriately trained health care professionals and also community-based lay and peer counselors.

Acknowledgement:

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References:

1. Fernández-Quintela A, Milton-Laskibar I, Trepiana J, Gómez-Zorita S, Kajarabille N, Léniz A et al. Key Aspects in Nutritional Management of COVID-19 Patients. Journal of Clinical Medicine. 2020;9(8):2589.
2. Dutheil F, Esquirol Y, Navel V. Will the COVID-19 pandemic decrease the FatMax?. Journal of Applied Physiology. 2020;129(1):1-1.
3. Naja F, Hamadeh R. Nutrition amid the COVID-19 pandemic: a multi-level framework for action. European Journal of Clinical Nutrition. 2020;74(8):1117-1121.
4. International Society for Infectious Diseases ProMed «PRO/AH/EDR> COVID-19 update (59): Global, cruise ship, more countries, WHO. [(accessed on 9 August 2020)];*Int. Soc. Infect. Dis.* 2020 Available
5. Zabetakis I., Lordan R., Norton C., Tsoupras A. COVID-19: The inflammation link and the role of nutrition in potential mitigation. *Nutrients.* 2020;12:1466. doi: 10.3390/nu12051466
6. https://www.who.int/emergencies/diseases/novel-coronavirus-2019?gclid=EAIaIQobChMI7bGTztrI7wIVg8x3Ch1w_QmqEAAYASAAEgJ0XfD_BwE
7. http://www.emro.who.int/ar/noncommunicable-diseases/campaigns/index.html