

(REVIEW ARTICLE)



Effect of water consumption over the immune system response given during Covid-19

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Abstract

Immune system, is the reactions initiated by the body to detect components, called antigens, with a different structure from its own genetic and to destroy those components. To have a strong and healthy immune system, a healthy diet is needed. Immune system also needs water to work properly and effectively.

When the contents of diet suggestions published are observed during the COVID-19 pandemic FAO (2020) informs that regular plenty of water consumption will help our immune system.

Water is also very important for hygiene in the context of the spread and control of COVID-19.

Adequate water supply must be provided for meeting the basic water need, prevention from diseases, successful disease treatment during the illness and general health. Clean water usage, access to clean and adequate water are one of the most significant steps in the world in improving child-adult health

Keywords: Immune system; water; covid-19; infections; nutrition; dehydration

1. What is immune system?

Immune system, is the reactions initiated by the body to detect components, called antigens, with a different structure from its own genetic and to destroy those components (1). The response given by immune system is divided into two as specific and non-specific (2). Immune response released by the people who encounter the specific antigen for the second time because of recognition, activation, differentiation, proliferation processes that begin to develop within 3-7 days and 2-4 weeks from the moment the allergen first enters the body takes place much faster and more effectively (3,4).

2. COVID-19

COVID-19 is a virus that the body considers as a foreign body and newly recognized. The disease process of people whose immune system can't create an effective and rapid response, is much more severe and heavy (5,6). Common symptoms reported at the starting of the disease are fever and dry cough. While the symptoms progressed until the multiple organ failure related to septic shock in some patients, it resulted in death approximately 10% of the patients (7). COVID-19 presents a wide range of clinical findings, from asymptomatic level to severe symptoms (8,9,10).

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3. SARS-CoV-2 infections progress in 3 stages

- Stage: The asymptomatic incubation phase where the patient doesn't have any symptom. The incubation period, is the duration between the time of contact with the potential source of infection and starting date of the symptom. Virus generally can't be detected in the first stage because there is no symptoms to suspect. SARS-CoV-2 infection can be taken under control in people at this stage, who are called silent carriers.
- Stage: Although there are no serious symptoms, midlevel symptoms appear at this stage. At the second stage, because of the symptoms felt, virus can be detected.
- Stage: 10% of the patients who are infected by SARS-CoV-2 virus, are being hospitalized at this stage due to critical and severe symptoms. Because clinical symptoms like fever and respiratory infections need to be controlled. Serious clinical progression at this life-threatening stage must be treated (8-13).

Immune reaction caused by COVID-19 clinically has 2 stages. First stage, is the incubation period during which severe symptoms are not observed and the virus causes a protective immune reaction. At this stage, strategies are adopted to increase immune reaction to prevent virus existence and virus progression to severe levels (8,10). When the response from the protective immune against the disease is not enough, inflammatory response, which is extremely harmful for the body, appears. Especially in the organs like kidney and intestine with ACE2 (angiotensin converting enzyme 2) expression and in the lungs, second phase characterized with massive tissue damage that starts and then the disease progresses to a serious phase. In COVID-19 cases manifested by diffuse alveolar and capillary damage, pulmonary edema, and pneumonia that can lead to acute respiratory distress syndrome (ARDS), multiple organ failure is a rapidly developing condition (10).

4. Effect of Water Consumption on Immune System Response

Immune system consists of mechanisms that respond to cellular stress, infection and tissue damage to defend against antigens that seems foreign to itself, to maintain tissue homeostasis and holobiont integrity (14). Immune system is divided into two as innate immunity and adaptive (acquired) immunity (15). There are many cells involved in the immune system such as lymphocytes and macrophages. Of these, the balance of CD4 + T cell clusters is critical in maintaining tolerance and responses against pathogens for antitumor immune responses (1, 14). Because when the CD4 + T cell encounters appropriate environmental signals, it can create a mutual response thanks to its ability to "differentiate" (14,15).

To have a strong and healthy immune system, a healthy diet is needed. Immune system also needs water to work properly and effectively.

Water, that creates 60-70% of the human weight, is essential to regulate a lot of functions like digestion, absorption, transfer, excretion, circulation of the biomolecules taken through food and regulation of body temperature (16). Recommended daily water consumption varies greatly from person to person as the need for water is affected by the age, gender, physical activity level, diet, body composition, pregnancy, environmental conditions and presence of the disease. While the adults with midlevel physical activities can meet their daily water recommendation by drinking 12 glasses of water and drinks, kids can meet this by drinking 4-5 glasses and old adults can meet this by drinking 9-13 glasses of water and other drinks (17). Water doesn't only enter the body by drinking but also by food and to a very small extent by metabolic water (18).

Some of the main functions of the water are; having an active part in the metabolism, modulation of the normal osmotic pressure, maintaining electrolyte balance and regulation of body temperature (19). Some abnormalities might be observed depending on dehydration when the body's water amount is decreased by 10%. Water decrease by 20% might even end up with dead (16).

Kidneys can't deploy their function of harmless substances removal from the body when water consumption is not sufficient. When the kidneys can't deploy their function of removing harmless substances from the body by filtering them, they weaken the immune system that is supposed to defend the infections and this causes a general inflammation (20).

One of the most important reaction of the immune system against the harmful effects is increasing the body temperature. Fever, which is a significant response of the immune system, is one of the main clinical symptom of the COVID-19 patients and 88.5% of them suffer from that (21). The interaction of exogenous pyrogens (e.g. microorganisms) or endogenous pyrogens (e.g. IL-1, IL-6, Tumor Necrosis Factor- α) with organum vasculosis (OVL)

of the lamina terminalis causes a fever. Increasing body temperature is associated with the innate immunity increase related to microbial degradation. Since the pathogens that cause an infection in the human body generally show optimal replication below 37° C, a high host temperature prevents reproduction (22). Fever, one of the immune system responses is given during the infection period, causes water loss in the body through sweating. Sweating, described as the evaporation of the water from skin surface, is an effective way to balance body temperature (22,23). When body temperature increases, it is important to consume sufficient amount of liquid to provide thermoregulation and replace the lost liquid (24). If the lost liquid caused by fever can't be replaced hypovolemia might occur related to dehydration (25). As a result of intravascular volume decrease, heart can't deliver enough oxygen and blood to the vital organs and can't remove metabolic waste products from tissues. If necessary liquid consumption can't be provided, a hypovolemic shock, which is an immunological chaos picture, is observed where cells' and tissues' normal metabolism degrades (26).

Vitamin B1, one of the water-soluble vitamins, is a cofactor for various enzymes involved in the tricarboxylic acid cycle used by cells in immunometabolism for energy production (27). In a similar way, B6 and B12 vitamins have various immune functions such as general support for the immune system cells and tissues, production of antibodies and memory cells, antimicrobial protein production, phagocytic activities of neutrophils and macrophages (28). Vitamin C, another water-soluble vitamin, is a strong antioxidant that protects the body against the endogenous and exogenous oxidative difficulties. Vitamin C, stimulates neutrophil migration to the infection site, increases phagocytosis, oxidant formation and microbial killing (29). Mentioned vitamins can have a protective effect in the different parts of our body in line with the solubility of water. Sufficient water consumption is essential in order to provide immune regulation and immunological protective effect through these vitamins provided with diet during the COVID-19 process (28, 29).

When the contents of diet suggestions published are observed during the COVID-19 pandemic Food and Agriculture Organization (2020) informs that regular plenty of water consumption will help our immune system. World Health Organization (2020) made an announcement about water that it has vital missions of carrying nutrients and compounds in the blood, regulating body temperature and removal of wastes from the body. For that reason, it recommends 8-10 glasses of essential daily water consumption, but also the consumption of fruits and vegetables that contain water. The first published recommendation of The Spanish Association of Dietitians-Nutritionists (2020) that provides good hydration. Hydration is always needed even if there is no feeling of thirst, water, the best source, needs to be consumed in abundance (17).

Various stress factors exacerbates the effects of COVID-19 disease inducing oxidative stress formation. Limited access to clean water and insufficient water consumption are the important factors that causes oxidative stress formation. Clean and sufficient water consumption is highly important during the period when the body struggles with oxidative stress using many molecules grouped in enzymatic systems (30).

Water is also very important for hygiene in the context of the spread and control of COVID-19. According to WHO, one of the most effective ways to decrease the possibility of getting infected is washing hands regularly with water and soap. The availability of water and the accessibility to it can affect the extent of COVID-19 spread in any given area by ensuring hygiene (17).

5. Conclusion

Adequate water supply must be provided for meeting the basic water need, prevention from diseases, success of disease treatment during the illness and general health. Clean water usage, access to clean and adequate water are one of the most significant steps in the world in improving child-adult health.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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