International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 4 July-Aug 2022, pp: 155-159 www.ijprajournal.com ISSN: 2456-4494

Functional foods a Covid-19 perspective

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Submitted: 01-07-2022 Accepted: 10-07-2022

ABSTRACT: To put it another way, "functional foods" are foods that may positively impact health that goes beyond the basics of nutrition. Functional foods come in the form of pills, capsules, or liquids that have been shown to provide physiological effects. They have exerted several therapeutic values that could help alleviate numerous non-communicable diseases. Functional foods significantly impact the host immune system, generating antiviral activities and synthesizing biologically active anti-virus agents. Dietitians increasingly used foods with disease-preventing properties during the pandemic situation, and this review discusses such functional food along with their functionalities.

KEYWORDS: Functional foods, COVID-19, Nutrients.

I. INTRODUCTION

Functional foods offer health benefits beyond nutrition, encompassing health-boosting supplements (López-Varela et al., 2002). Additional to their nutritional value, functional foods may reduce the risk of one or more non-communicable diseases such as cardiovascular diseases, cancer, and diabetes and promote optimal health conditions. It is functional food as long as it has been tested in an intervention trial to meet local regulations like the European Food Safety Authority in the European Union and the Food and Drug Administration in the United States (Granato et al., 2020). Moreover, the other critical inclusion factor for functional foods is that they can be taken without a medical prescription and evidence that regular consumption as part of a well-balanced diet has health benefits. Natural or processed food items that provide essential nutrition and may also have beneficial effects on the host's health include those that enhance the immune system's ability to prevent and control infections by pathogens and those that alter the host's ability to perform daily tasks (Aguilar-Toalá et al., 2018). The presence of bioactive compounds is a common feature of functional foods. Nutraceuticals, probiotics, prebiotics, and synbiotics are just a few examples of functional foods that are not fermented. However, there is no scientific consensus on differentiating between food supplements, nutraceuticals, and functional foods. Functional foods differ from dietary supplements in the following ways: In addition to serving as a dietary supplement, functional foods are expected to play a role in disease prevention and treatment, and they can be used in either a traditional food form or as the sole component of a meal or diet (Kalra, 2003). Nutraceuticals and the functional food concept have been developed due to the usefulness of dietary components other than essential nutrition (Laparra and Sanz, 2010). One mechanism by which functional foods work is to lower low-density lipoprotein and raise total cholesterol levels in the blood (Boussageon et al., 2011).

Several of which are reviewed due to numerous factors, including the declension of personal health due to busy lifestyles, substandard food choices made in convenience stores, and a competitive food market, functional foods have accelerated. These factors include transitional health, urbanization and its effects, changing demography with an aging population, and food security. The lifestyle changes and food patterns, insufficient physical activity, and self medications have led to the necessity of nutritional research. Products that deliver a tasty treat and a health benefit have become increasingly popular with consumers. This is the driving force behind creating the category of "functional foods." One of the current trends in the nutraceutical industry can be seen in the emergence of these products, which sit on the precipice between food and nutritional supplement. A well-balanced diet is the best defense against malnutrition and the best way to stay healthy. This task can be complicated by the effects of aging and the presence of other diseases. Because of this, it is possible to improve health and well-being and reduce the risk of illness by consuming

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functional foods that contain an increased amount of a particular nutrient or bioactive compound.

Undernutrition and infection rates fall due to an increase in total and saturated fats, omega-6 fatty acids, and trans fats, along with a decrease in the intake of complex carbohydrates in most developing countries (Xu et al., 2006). Foods containing dairy products, eggs, meat, and added sugar are more commonly consumed in India's urban populations than in rural China. Overweight and hypertension are more prevalent in China than in India because of metabolic syndrome and diabetes (Kearney, 2010). In 1995, malnutrition in China was comparable to diet-related non-communicable diseases (NCDs), but by 2025, the prevalence and costs of diet-related NCDs are expected to skyrocket dramatically. While undernutrition costs in India have continued to fall, the cost of overnutrition and diet-related NCDs has continued to rise (Mashau and Ramashia, 2021). As the number of NCDs in India continues to rise, the economic costs of under and overnutrition would continue to rise until at least 2025. NCDs' economic burden is examined in light of the correlation between income and a shift in diet and related diseases. We humans profoundly impact our health, environment, and social well-being through our food choices.

II. FUNCTIONAL FOOD IMMUNE RESPONSE AND COVID 19

A weakened immune system and low micronutrients, such as vitamins and trace elements, are standard for human viral infections (Calder et al., 2020). The immune system's efficiency can be maintained by consuming a variety of nutraceuticals in functional foods and supplementing these functional foods with adequate dietary intake, which boosts the immune system and helps prevent COVID-19 (Alkhatib, 2019, Gombart et al., 2020). Vitamin C's beneficial effects on health are well-documented. Numerous effects are associated with its ability to donate electrons, making it an essential nutrient that humans cannot produce independently (Carr and Maggini, 2017). Vitamin C is essential for wound healing, tissue repair, the functioning of certain enzymes, and the modulation of the immune system. Free radicals and exposure to toxins and pollutants can damage essential biomarkers such as vitamin C, an excellent antioxidant (Carr and Frei, 1999). The biosynthesis of carnitine, a molecule involved in the transport of fatty acids into the mitochondria, is also made more efficient with its

Virus particles spread through the respiratory tract during the COVID-19 infection process, infecting nearby cells that aren't already infected (Sayed et al., 2020). The rapid replication of the virus in alveolar epithelial cells triggers a robust immune response, resulting in the development of cytokine storm syndromes and pulmonary tissue damage. When proinflammatory cytokines are produced out of control, it can lead to ARDS and multiple organ failures, including the lungs, heart, intestine, and blood vessels. Cytokine storms and hypercytokinaemia are terms used to describe this group of disorders (Channappanavar and Perlman, 2017, Li et al., 2020). Fever, a dry cough, and exhaustion are the most common symptoms 2-14 days after infection before symptoms appear. Some of the less common symptoms include a headache, a loss of taste and smell, sore throat, and diarrhea. Chest pain or pressure, difficulty breathing, and a loss of speech or movement are all severe symptoms. About 80 % of all cases have mild symptoms or may be asymptomatic, while the remaining 15 percent and 5 percent are severe and require oxygen and ventilation (Hamid et al., 2021). This review features the effectiveness of functional food for Covid-19 and their future perspectives on infectious diseases

presence as a cofactor (Du et al., 2012). When it comes to treating the common cold, it is commonly used as an adjuvant, with a meta-analysis showing that it has a positive effect on reducing symptoms (Douglas et al., 2000, Johnston et al., 2014).

Vitamin D deficiency is widespread, and a high-dose vitamin D intervention that could reduce the risk of COVID-19 severity and mortality is recommended, a safe and non-intrusive treatment. Large doses of vitamin D for a week, followed by several thousand IU/d vitamin D for the next two weeks. Serum vitamin D levels may improve, leading to better prognoses and clinical outcomes (Ebadi and Montano-Loza, 2020). Immune responses to the COVID-19 pandemic can be improved, infections and inflammation can be minimized, and lung injury can be prevented through zinc's ability to inhibit viral replication by interfering with viral genome transcription, protein translation, and attachment. When it comes to containing the unprecedented global health crisis and economic catastrophe caused by the COVID-19 pandemic new information about zinc supplementation in hospitalized COVID-19 patients may be revealed (Oyagbemi et al., 2021).

The Institute of Medicine and the United Nations Nutritional Policy Board recognize iodine

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as an essential nutrient for healthy immune function (Trumbo et al., 2001). Iodine deficiency has been linked to many health problems (Black, 2003). The leukocyte myeloperoxidase enzyme uses iodine in cell-mediated immunity and is an essential component of many immune cells (Klebanoff et al., 2013). In addition, iodides have many other biological effects, such as regulating inflammation, improving phagocytosis of bacteria by immune cells, and enhancing the innate immune system (Bilal et al., 2017). The instability of iodine is its most significant drawback. Iodine deficiency is common in today's diet and lifestyle. Iodine metabolism can be hampered by high dietary perchlorate, glucosinolate, thiocyanate, calcium nitrate, cobalt, and rubidium intakes (Klebanoff et al., 2013, Rogan et al., 2014). Fluoride in water and toothpaste, for example, further depletes our bodies' iodine supply when used in the home. We might be able to develop a different strategy for looking for antiviral drug molecules if we use our traditional or ethnobotanical knowledge. There are many compounds and secondary metabolites in plants that can be used in drug formulations, according to the ancient Indian medical system known as Ayurveda.

Certain herbs, decoctions, and plant-based formulations are believed to be immune boosting in this medical system. Our body can fight infections in a better way with increased immunity. Antiviral properties have been demonstrated for several plant-derived compounds. Plants with anti-viral properties and their use in traditional medicine have been compiled in this article (Jayakumar et al., 2013). Amla, also known as Indian gooseberry or Emblica OfficinalisGaertn, is an essential medicinal plant in the Euphorbiaceae family. All plant parts have medicinal value, but the fruit is the most widely used in Indian medicine as a diuretic, restorative, hair tonic, laxative, anti-pyretic, ulcer preventive, and liver tonic. For the common cold & fever, among other uses, Vitamin C, which is found in abundance in the fruit, helps strengthen the immune system. The amla fruit's pentagalloyl glucose can inhibit influenza. Two mechanisms are used to prevent virus adsorption and suppress virus release during the replication of a virus (Dasaroju and Gottumukkala, 2014). Echinacea purpurea can help prevent and treat colds and flu as an immune stimulant. Echinacea has been shown to boost the immune system by activating immune cells like lymphocytes and macrophages (See et al., 1997). As a result, Echinacea appears to increase interferon production, a group of signal proteins released in response to viruses, enhancing the immune response to viral infections. The efficacy of Echinacea in treating colds and the flu has been demonstrated in numerous double-blind clinical studies (Percival, 2000).

It is possible that probiotics could positively impact the innate and adaptive immune systems in the context of the Covid-19 infection (Akour, 2020). Influence on intestinal epithelial cell cytokine production, stimulation of IgA secretion to improve mucosal immunity, activation of phagocytosis and macrophage production, modification of regulatory cell levels and function, and induction of dendritic cell maturation are just a few of the probiotic actions that may have an impact on systemic inflammation (Bottari et al., 2021). For the treatment of respiratory tract viral infections, probiotics are being considered. COVID-19 affects intestinal microbiota dysbiosis (Xu et al., 2020).

The WHO has declared COVID-19 a worldwide pandemic due to a novel virus that has grappled with an inevitable threat of maintaining a sound immune system and health. This also has led humankind to rethink natural remedies to improve human immunity through proper nutritional maintenance. As a result, a healthy diet rich in bioactive compounds derived from plants can help people stay healthy by reducing their vulnerability to viral infection. When it comes to disease prevention, the body is in desperate need of food with functional components, and this is where functional foods come into play. The antioxidants and polyphenolic compounds found in fruits and vegetables, such as quercetin, resveratrol, and anthocyanins, can help treat or prevent SARS-CoV-2 and COVID-19, respectively, as well as boost the immune system's ability to fight these infections. As a result of the virus's worldwide spread, it may be possible to combat COVID-19 infection by ingestingfunctional foods.

III. CONCLUSION

There is a global pandemic of the novel coronavirus, which has severe mortality and limited access to its treatments and medicines. Since there is a lack of time and resources, most vaccines are underdeveloped or unavailable to the general public. A growing body of research suggests functional foods as an additional treatment option for COVID-19. Functional foods have been found to influence the immune system of their consumers, produce antiviral effects, and produce biologically active compounds that are effective against coronaviruses. Toxicology studies must also be

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Volume 7, Issue 4 July-Aug 2022, pp: 155-159 www.ijprajournal.com ISSN: 2456-4494

considered when prescribing a diet rich in functional foods. Toxicity evaluations reveal the need for additional safety tests on different functional foods, and ensuring their levels are consistent with the most recent research data in a regular diet is essential. Because the dosage of functional food affects pre-existing conditions differently, specific safety levels for these individuals must be assessed.

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