

COVID 19, a pandemic crisis: Transition of Consumer awareness on functional food to build immunity: A Review

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Abstract:

The rapid outbreak of COVID-19 had been affected globally specially in enormous health, economic, environmental and social challenges worldwide. With the increasing COVID positive cases day-by-day, the health authorities advocated the need to follow a healthy lifestyle with a healthy diet rich in vitamins, minerals, and bioactive components to boost the body immune system. There are so many functional foods that promote immune response and help to prevent various inflammation in the body. These foods include probiotics, prebiotics, herbal beverages, dietary fiber, fortified foods, enriched foods, hydrolyzed proteins etc. These foods can control symptoms and reduce the severity of chronic diseases and further promote general wellbeing. The main aim of this paper is to assess consumer awareness, consciousness of including functional food in their diet after facing a long term pandemic crisis. To assess the consumer awareness of eating functional food after COVID 19 a systematically literature review is done using Google scholar, PubMed, Web of Science, Springer. This paper could therefore be used

as a comprehensive resource for educating consumers and the general public awareness about importance of eating functional food to promote a healthy life style that can enhance the body's immune support system to fight against various infections including COVID-19 and other variants.

Keywords: Consumers, Awareness, Functional food, COVID 19, Immunity

Introduction

The rapid outbreak of COVID-19 had been affected globally specially in enormous health, economic, environmental and social challenges worldwide. With the increasing COVID positive cases day-by-day, the health authorities advocated the need to follow a healthy lifestyle with a healthy diet rich in vitamins, minerals, and bioactive components to boost the body immune system.

The coronavirus disease 2019 (COVID-19) was declared as global pandemic on 11 March 2020 by World Health Organization (WHO). The disease cost innumerable human lives and infected millions worldwide. At present, several COVID-19 vaccines have been approved for human use that have not been rolled out yet worldwide, due to challenges such as its surplus production, reasonable price, balanced distribution to all needy countries and delivery at the local level (Alfawaz et al., 2021). The Indian government initiated a nation-wide lockdown as a counteractive measure from March 25, 2020 to May 31, 2020. COVID 19 had spread many countries and was wreaking havoc around the world. In addition to the severity of the disease, which affected numerous organs through immunological, inflammatory, and redox mechanisms, the use of functional foods and dietary supplements, such as vitamins and minerals, which may provide some protection by boosting the immune system and helping to reduce disease severity, had emerged as a potential dietary or therapeutic adjuvant treatment for COVID-19 (Chavda et al.; 2022).

Table 1: Market segments of functional foods and their benefits (Kaur et al., 2011)

Category of functional foods	Major source and Active compound	Benefits
Fruits and vegetables	Polyphenols such as anthocyanin, flavonol	Prevent Cardiovascular diseases, cancer, diabetes
Cereals	Insoluble dietary fiber, water-soluble fiber	Lowering cholesterol, act as prebiotics
Dairy	Bioactive peptides in milk	Lowers blood pressure, preventing cardiovascular diseases
Tea	Catechin (Polyphenols)	Anticancer, antioxidant, antiviral, antibacterial activities
Egg	Omega-3 polyunsaturated fatty acids	Prevent CVD.
Seafood	Omega-3 fatty acid, Protein	Anticancer, antihypertensive, and antioxidant properties
Meat	Conjugated linolenic acid (CLA), taurine, L-carnitine, creatine, antioxidants	Reduce the risk of cardiovascular disease
Vitamins	Vitamin A, C, E, K and Vit B complex	Prevent anaemia, osteoporosis, help in eye, skin health
Herbs	Curcumin in turmeric, Cinnamon in clove	Prevent bronchitis, asthma, cardiovascular disease Contains immunological benefit

Scientific data on the mechanisms underlying the bioactivity phenolic compounds and their usefulness in COVID-19 mitigation had reviewed. In addition, antioxidant, antiviral, anti-inflammatory, and immunomodulatory effects were also studied [Augusti et al., 2021]. Macronutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins, copper, zinc, iron, calcium, magnesium, and selenium) in supporting the immune system's fight against respiratory infections. Each of

these nutrients performs a vital role as an antiviral defense in COVID-19 patients. Appropriate consumption or intake of dietary sources that yield these nutrients will help provide the daily requirement to support the immune system in its fight against pathogenic viruses such as COVID-19 [Batiha et al., 2022]. Another study explained the influence of extracts or pure molecules from medicinal plants on COVID-19. The study covered emerging technologies using plant-based SARS-CoV-2 vaccine. They concluded by giving nutrient and plants curative therapy recommendations which are of potential interest in the COVID-19 infection and could play the way for pharmacological treatments or co-treatments of COVID-19 [Brahmi et al., 2022]. Another article presented a pragmatic protocol for early nutritional supplementation of non-critically ill patients hospitalized for COVID-19 disease. Observation found that most patients present at admission with severe inflammation and anorexia lead to a drastic reduction of food intake [Caccialanza et al., 2020]. A number of vitamins (A, B₆, B₁₂, folate, C, D and E) and trace elements (zinc, copper, selenium, iron) have been demonstrated to have key roles in supporting the human immune system and reducing risk of infections. Other essential nutrients including other vitamins and trace elements, amino acids and fatty acids are also important. It would seem prudent for individuals to consume sufficient amounts of essential nutrients to support their immune system to help them deal with pathogens should they become infected. The gut microbiota plays a role in educating and regulating the immune system. Gut dysbiosis is a feature of disease including many infectious diseases and has been described in COVID-19. Dietary approaches to achieve a healthy microbiota can also benefit the immune system [Calder PC, 2020]. Another review summarized the role of nutraceuticals in the prevention and treatment of COVID-19 disease and post-COVID syndrome. Nutraceutical products, including vitamins (C, D, and E), minerals (zinc), melatonin, probiotics, flavonoids (quercetin), and curcumin have significant anti-inflammatory properties to cure COVID infection related symptoms [Catalano et al., 2022]. Another study described the potential prophylactic and therapeutic effects of curcumin, zinc in treatment of viral infections

including COVID-19. Study revealed that Curcuminoids and Zinc were classified as nutraceuticals under GRAS (Generally Recognized As Safe) for COVID 19 patients with their immunity-boosting and antiviral properties [Celik et al., 2021]. A review had focused on the effects of vitamin C on immune function, summarizing the most relevant studies from the prevention and treatment of common respiratory diseases to the use of vitamin C in critical illness conditions, with the aim of clarifying its potential application during an acute SARS-CoV2 infection [Cerullo et al., 2020]. Another article evaluated effectiveness of herbal medicines in COVID-19, the antiviral activity of nutraceuticals, and the significance of these results in creating dietary supplements that would enhance innate immunity and contribute as preventive measures against severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) [Chavda et al., 2022]. Micronutrients, metalloids, and vitamins such as iron, manganese, selenium, Zinc, Copper, vitamin A, B family, and C are among the essential and trace elements that play a pivotal role in human nutrition and health. They participate in metabolic processes that lead to energy production. Therefore, maintaining an optimal level of micronutrients intake, particularly those with antioxidant activities, is essential to fight against oxidative stress, modulate inflammation, and boost the immune system. So these factors could play a crucial role in COVID-19 prevention and treatment [Fath et al., 2022]. Another review showed the roles of vitamin D in reducing the risk of respiratory tract infections, knowledge about the epidemiology of influenza and COVID-19. The evidence found that Vitamin D supplementation helps to reduce risk of influenza and COVID-19 infections and deaths [Grant et al., 2020]. An online study of google trend analysis showed that respondents tended to start supplementation during the first COVID-19 wave rather than the second one. Except for the role of vitamins D and C, zinc, and selenium in patients with deficiencies of those nutrients [Hamulka et al., 2021]. An app-based community survey investigated whether users of the COVID-19 Symptom Study app who regularly took dietary supplements were less likely to test positive for SARS-CoV-2 infection. In women, the study observed a

modest but significant association between use of probiotics, omega-3 fatty acid, multivitamin or vitamin D supplements and lower risk of testing positive for SARS-CoV-2 [Louca et al., 2021]. Another study had demonstrated that zinc helps to reduce viral replication and increase immune responses. Zn supplement consumption provide an additional shield against the initiation and progression of COVID-19 [Razzaque et al., 2021]. Another review found that dietary components such as vitamins C, D, E, zinc, selenium and the omega 3 fatty acids have immunomodulatory effects along with benefits of infectious disease. Some of these nutrients have also been shown to have a potential role in the management of COVID-19 [Shakoor et al., 2021].

The review paper focuses on to assess the consumer awareness of eating functional food during and after pandemic, to gain knowledge about consumer demand and choice for purchasing functional food after COVID.

Methodology:

Source: This article was systematically reviewed literature using Google scholar, PubMed, Research Gate, Web of Science, Springer.

Inclusion criteria

- Limitation to papers published in the years 2020, 2021, 2022, 2023, 2024.
- Studies investigating using the keywords connection of the pandemic and consumption of functional foods.
- Only full-text publications in English were considered.
- The majority of studies were cross-sectional, descriptive and qualitative in design.

Discussion

Many research efforts have been devoted to explaining the role of nutritional supplementation in the prevention and management of COVID-19 infection.

An empirical study investigated Branded Functional Beverage (BFB) consumption behavior in the post-pandemic setting using a psychosocial theoretical framework derived from the tenets of Theory of Planned Behavior (TPB) and the Health Belief Model (HBM). This study revealed that perceived behavioral control and subjective norms were significant predictors of BFB purchase intention and subsequent consumption behavior in the post-pandemic period [Natarajan et al., 2022]. A cross-sectional online survey examined changes in dietary habits and associated practices, physical activity during the COVID-19 pandemic and before the onset of lockdowns in three European countries. An increased frequency of the daily consumption of food products such as dairy, grains, fats, vegetables and sweets and a rise in the frequency of purchasing frozen goods and food with long shelf life [Skotnicka et al., 2021] A prospective cohort study investigated usage patterns and factors associated with maternal dietary supplementation by Chinese women. High educated mothers were more likely to use dietary supplements in their postpartum period. But folic acid intake was well below the guidelines [Tang et al.,2017]. Another survey was conducted including 257 respondents who were actual users of dietary supplements. It showed that the main drive for buying dietary supplements during the COVID-19 pandemic is the emotion of fear, as the consumers perceived this new disease as a threat to their health and life [Vuković et al., 2022]

Conclusion

Functional foods like vitamin and mineral supplementation are critical during and after COVID-19 in order to reduce the severity of symptoms and shorten the duration of respiratory infection, thereby improving immune responses. Several research reports showing an increased interest in dietary supplements such as vitamins (C, A, E, and D), zinc, omega-3, probiotics, selenium, and others during the COVID-19 pandemic and post pandemic for consumers. Young individuals and educated people consume functional foods for health benefits, especially during and after this pandemic situation, and to prevent the risk of chronic diseases. But, a

lot of people still need to learn. This paper could therefore be used as a comprehensive resource for educating consumers and the general public awareness about importance of eating functional food to promote a healthy life style that can enhance the body's immune support system to fight against various infections including COVID-19 and other variants.

Interpretation

Functional foods have many beneficial effect for consumers and also promotes immunity to fight against several infection, inflammation, life style disorders such as obesity, diabetes, hypercholesterolemia, hypertension, stroke, liver disease, gastrointestinal, respiratory and neurological problems etc. Functional foods including probiotic rich foods such as milk, curd, yoghurt, cheese, paneer, kefir, pickle have therapeutic effect for human health. These foods contain adequate protein, unsaturated fat, vitamins, minerals and dietary fiber. These nutrients play significant role for providing energy, building muscle mass, and help in metabolism, digestion and absorption. Functional foods and supplements help to cure symptoms of pandemic corona virus and also helps in rapid recovery. Thus proper nutrition and diet play an important role in maintaining health and wellbeing for consumers.

Conflicts of Interest

The authors declare no conflict of interest.

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