

Poverty, Obesity and the Risk of COVID-19

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Abstract

In the present article, we clarify the possible connection between nutrition and socio-economic status, with infection and COVID-19, as well as a special emphasis on quality of diet and inflammation. We demonstrate a theoretic framework along with different lines of evidence from several studies that support the idea that low-income people may be affected by covid-19 dramatically, and the condition leads them to be more susceptible to infection by covid-19. Following a healthier and affordable diet, probiotics, and functional food may modulate immunity, increase resistance to infection, and/or faster recovery rates in low-income people or people who have lost their jobs, and income because of COVID-19. These strategies demonstrate how healthcare outcomes and policies can be enhanced with the implementation of a more nutrition-oriented approach.

Keywords: Nutrition therapy • Inflammation • Diet • Supplements • Income

Introduction

Coronavirus disease (COVID-19) is a respiratory disease initiated by the novel coronavirus (SARS-CoV-2) that has been announced as a pandemic. In recent months, people in many countries are in quarantine, to prevent infection with Covid-19 and spread it [1]. Undesirable change of life including income loss/ reduced income [2], rumors and misinformation about foods [3], food supply chain disruptions [4] and increasing stress [5] can affect the quality of diet and consequently may play important role in vulnerability to infected with COVID-19 and its complications. Therefore, an urgent plan to investigate health management strategies to diminish the transmission of COVID-19 and its complications seems necessary.

Crises people face during COVID-19 pandemic

With the onset of the COVID-19 pandemic, some families lost their jobs or faced declining incomes. Low-/middle- income people experience problems in purchasing adequate nourishing foods to have healthy life [2]. High prices of healthy foods are assumed the main convincing problem to obtaining a high-quality diet [6].

In addition, Managing rumors, dispelling misinformation and, and mitigating fear and stigma directed toward some food are essential to pandemic preparedness and control. For example, misinformation and fear about the impossibility of disinfecting fruits and vegetables cause them to remove them from the household basket [3].

Food supply chains disrupted critically among countries even have an effect on urban and rural areas inside each country. Limitations of import and export caused some difficulties in transportation of main food items, accessing to food processing units, and markets. So, producers and consumers were impressed. Eventually, not only income of farmers may decrease but also food expenses become unstable and lead to short-term food shortages [4].

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Increased social disorder and emotional distress in world wild, the symptoms such as depression and anxiety, emotional distress, nervousness, fear, and anxiety-induced insomnia reported during quarantine, and/or after recovery from coronavirus [5,7].

In this crisis, some people may consume high energy low prices food which contains a high amount of simple carbohydrate and fat regularly that associated with increased obesity and inflammation during the time. Moreover, some people are deprived of the protective effects of fresh and nourishing foods like fiber and vitamin C, which may be less affordable [6].

Description

The immune system must maintain the balance between inflammatory and anti-inflammatory responses to protect the body against viruses such as COVID-19 [5]. An unhealthy diet congaing a high amount of refined carbohydrates and fat, also an insufficient amount of fibers, antioxidant and phytochemicals can intensify the production of pro-inflammatory cytokines as well as decrease the total number of the anti-inflammatory immune cells, through the microbiota-gut-brain axis [1]. These Cytokines disrupt the balance of the immune system also develop obesity [2]. Excessive production of inflammatory immune cells [interleukin 6 (IL-6), monocyte chemoattractant protein-1 (MCP-1), macrophage inflammatory protein α (MIP- α), interleukin 1 α (IL-1- α), Interferon γ (IFN γ), and Tumor necrosis factor- α (TNF- α)], and overreaction of the immune system to SARS-CoV-2 caused "Cytokine Storm" (Figure 1) [3].

Figure 1 shows a suggested frame for interaction between social- economic status, quality of diet, and suppression of immune system in low-income people during the COVID-19 pandemic.

Improving immune system function by nutrition

Obesity: Chronic stress can stimulate the hypothalamic-pituitary- adrenal axis (HPA), through overregulation of satiety-related hormones, such as leptin, insulin, and ghrelin towards modifying feeding behavior in the long-term. We recommended Mediterranean diet, EAT-Lancet diets and intermittent fasting (IF) for health and weight management, at this time.

Mediterranean diet, with olive oil as the main fat source, moderate intake of dairy and meat, and emphasis on a higher intake of Omega 3, vegetables, legumes, fiber and fruit can significantly improve markers of inflammation in clinical trials studies, and recommended at the time of COVID-19 [6,7]. Moreover, it seems we need a healthy diet which provides all of the individual requirements and be affordable and available for the low and middle income population in the COVID-19 pandemic.

The EAT-Lancet diet is cheaper and more practical than the Healthy US

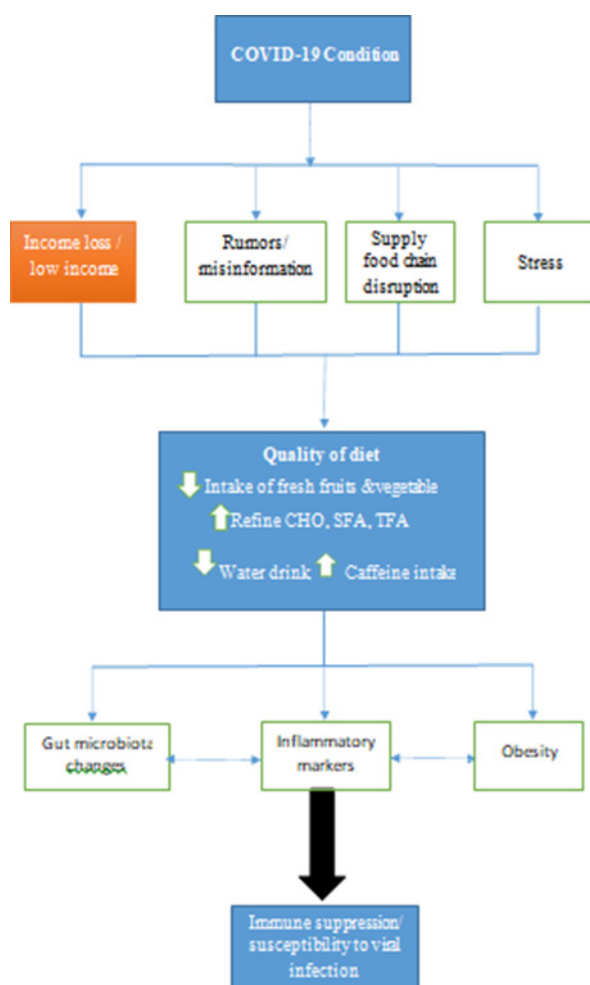


Figure 1. Interaction between social economic status, quality of diet and suppression of immune system in low-income people during COVID-19 pandemic.

pattern (HUS), Healthy Mediterranean pattern (MED), Health Vegetarian pattern (HV). The EAT-Lancet diet suggests 25-33% more total grains and 60%, 45-56%, 80%, 31-45% less starchy vegetable, fruit, red meat, solid fats, and added sugars than Healthy US pattern (HUS), and Healthy Mediterranean pattern (MED). In addition, Beans and peas provide 47% protein of the EAT-Lancet pattern [1]. However, this diet is not cheap in some countries [7]. Hence, the governments could implement combination of policies include increasing income, nutritional aid, and decreasing the prices of nourishing food to support the low and middle income countries.

Nutrition and behavioral health

We recommended people with symptoms of anxiety and depression: Firstly, more consumption protein sources such as lean meats, fish, nuts, and dairy products. These foods provide the amino acid tryptophan, which is involved in the synthesis of brain serotonin, a neurotransmitter in the brain that play role in improving mood. Secondly, a decrease in soft drink and use of complex carbohydrates can help to regulate blood sugar, and prevent rapid blood sugar fluctuations, and recommended. Finally, in addition to a balanced diet, drinking

enough water to stay hydrated, and avoid alcohol can help relieve anxiety [2].

Nutrition and gut microbiota

The normal gut microbiota is a key player in human well-being. Interestingly, there is a vital bidirectional connection between the gut microbiota and the lung that is called "gut-lung axis" [2,1]. During exposure to a pathogen like SARS-COV 2, metabolites of gut microbiota bind to their receptors in immune cell-like macrophages and are starting a cascade of the event that has resulted in a balance between pro-inflammatory cytokines like T helper 17 (Th-17), IL-1, IL-6, TNF- α , and anti-inflammatory T reg cell. Accordingly, prevent extreme immune responses which ultimately develop damage to the lungs and other vital organs like heart, brain [2] Some components in food such as whey protein, dietary fiber like wheat bran and fructooligosaccharides (FOS), galactosachharides (GOS), and resistant starch increases the beneficial microbiota and SCFA (Short-Chain Fatty Acid) signaling pathway. Conversely, consumption of high animal protein and saturated fatty acid decreases the strain of pathogenic bacteria [3]. A principal diet along with probiotics, prebiotics, synbiotics and functional food may modulate immunity, increase resistance to infection, and/or faster recovery rates. Hence, the modified dietary strategy could be implemented for people who susceptible to infection with the COVID-19.

Conclusion

Supportive nutrition of low and middle income family and choosing valuable low price foods and diet along with nutritional supplementation may control obesity, improve gut microbiota could strengthen the immune system to prevent and battle against COVID-19, particularly in low-income people or people have lost their jobs, and income because of COVID-19.

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