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Immunonutrition and Corona Virus Disease 2019 (Covid-19)

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Introduction

In late December 2019, severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) initially emerged in Wuhan, Hubei, China, causing the potentially fatal COVID-19. It was then officially declared as a pandemic by the World Health Organization on 11 March 2020. This paper assesses the existing facts concerning to immune-nutrition, with a specific focus on respiratory viruses. In the nutrition segment, a promising body of facts exploring inter-relationships between certain nutrients and immune capability already occurs. This could possibly be crucial in assisting the body to cope with the corona virus, particularly among the elderly. Facts for vitamin C, vitamin D and zinc and their functions in preventing pneumonia and respiratory infections (vitamins C and D) and strengthening immunity (zinc) seems predominantly promising. One recent review recognized that arrange of micro nutrients are essential to meet the complex requirements of the immune system, including vitamins A, D, C, E, B6, B12, folate, copper, iron, zinc and selenium, with numerous of these having likely synergistic associations. Nevertheless, it was reckoned that the major body of evidence linked to immune function occurred for vitamin C, D and zinc [1].

Immunity Emphasis

The human immune system consists of four key components T cells, B cells, the complement system and phagocytes which are essential in protecting the organism against foreign intruders [2]. The immune system is the body's main defense barrier against infections, and therefore any flaws could possibly be

harmful to the host [3]. It has been established that a 'well-nourished' immune system is a means of facilitating to offer defense against pathogenic organisms [4]. It has been indicated that an ideal immune system must be always alert and checking for signs of danger or invasion [5]. Professor Philip Calder is one of the prominent experts in nutritional immunology and has published extensively on this topic. In his article 'Feeding the Immune System', he describes that the immune system works by functioning as an exclusion barrier, detecting and removing pathogens as well as including complex interaction between various cell types and chemical mediators [4]. Unfortunately a weakening in immune function is normally unavoidable with ageing, a process denoted scientifically as 'immunosenescence', which usually includes the decline of both innate and acquired immune systems [6]. With respect to respiratory conditions, the collective effects of compromised immune function, weakness and length of exposure to pathogens mean that elderly are innately susceptible to pulmonary disease [7]. However, there is possibility innate and acquired immune function may be reinforced by human nutrition, predominantly in cases where this is suboptimal, such as in clinical settings and in the elderly possibly assisting to reduce the risk of infections, their severity and promote recovery(Figure 1).

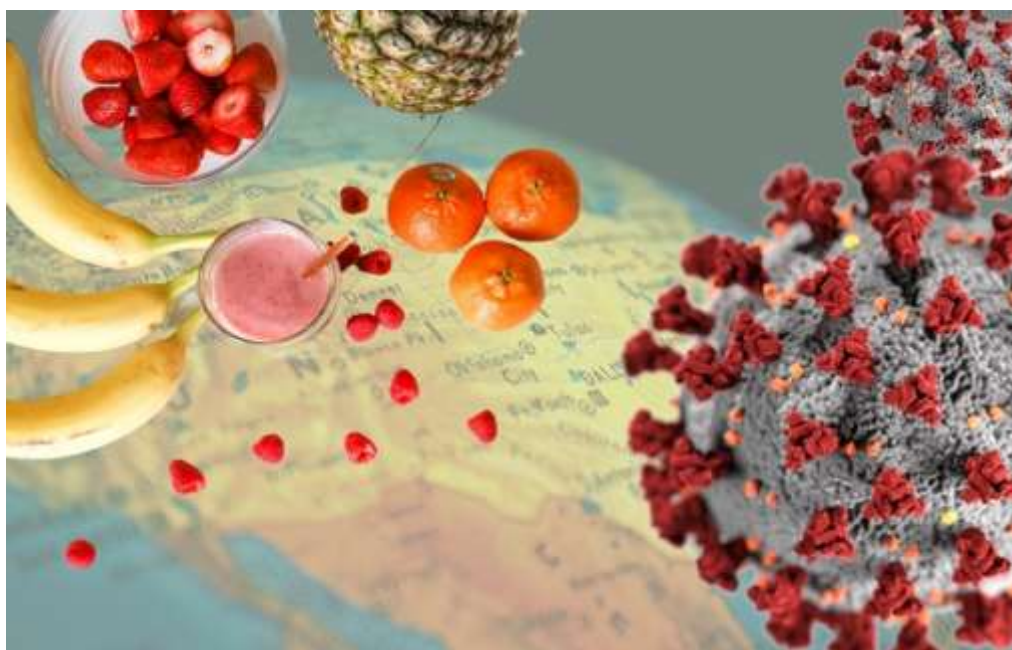


Figure 1: Immunonutrition and Corona virus.

Vitamin C

Vitamin C was purified in the early 1930s and subsequently several German and U.S. doctors suggested that vitamin C may be useful in the treatment of pneumonia [8]. Historically, vitamin C has been employed for immune support. A review published in 2017 deduced that three controlled trials discovered that vitamin C prevented pneumonia and two controlled trials detected a treatment benefit of vitamin C for patients with pneumonia [8]. A previous Cochrane review, conducted in 2013; collected data from three prophylactic trials, obtaining a statistically significant (80% or greater) decrease in

pneumonia occurrence in the vitamin C groups [9]. It was then reckoned that therapeutic use of vitamin C supplementation could be practical for patients with pneumonia and low plasma vitamin C levels considering its low cost and health risks. It is well acknowledged that infections increase oxidative stress. Infections usually activate phagocytes which release reactive oxygen species, which are oxidizing agents. Vitamin C is a well-known antioxidant that can neutralize these effects.[8]In one research a respiratory syncytial virus decreased the expression of antioxidant enzymes and later increased oxidative damage [10].

Vitamin D

It is well valued that vitamin D is a powerful immune regulator, with vitamin D receptors being expressed by most of the immune cells (B and T lymphocytes, macrophages and monocytes). It has also been suggested that immune cells themselves can convert 25(OH)D₃ into 1,25(OH)₂D₃, its active form [11]. It has been stated that respiratory epithelial cells, macrophages and monocytes express vitamin D receptor, and assumed that vitamin D can behave as a potential adjuvant in protecting and treating patients with respiratory viral infections who usually have lower level of vitamin D [12]. It was also stated that vitamin D deficiency is related with a higher risk of viral acute respiratory infection and discovered that vitamin D metabolites controlled the expression and secretion of type 1 interferon, chemokines CXCL8 and CXCL10, and pro-inflammatory cytokines, including tumor necrosis factor and interleukin-6 [13]. A systematic review and meta-analysis have gathered evidence from 25 separate randomized controlled trials (n=11321 participants) investigating the effects of vitamin D supplementation on acute respiratory infections among those aged 0-95 years. Protective effects were observed among all participants, but predominantly among those with baseline 25-hydroxyvitamin D levels <25 n mol/L, suggestive of deficiency. On the whole, the authors reckoned that vitamin D seemed to be a safe approach to protect against acute respiratory tract infections [14].

Zinc

Zinc is considered as a 'gatekeeper' of immune function: it is vital for the performance of the immune system. Zinc ions play a function in the control of intracellular signaling pathways in adaptive and innate immune cells [15]. Zinc is also entailed in inflammation, promoting inflammatory responses and stimulating cell-mediated immunity, and is a main constituent of pathogen-eliminating transduction pathways that contribute to neutrophils extracellular traps (networks which bind pathogens) development [16]. No meta-analysis or Cochrane reviews have been conducted in this field. Amongst pediatrics a review of some studies concluded that zinc supplementation for more than 3 months could be effective in preventing pneumonia in children younger than 5 years of age, even though the evidence was not strong enough to support preventive measures if given for shorter durations [17]. In the elderly it is known that insufficient zinc levels weaken immune function, decreases pathogenic resistance, and is associated to greater incidence and extent of pneumonia, along with total mortality [18].

Nutritional Enhancement

Public health strategies linking immunonutrition might be an alternative method to encourage rehabilitation and lessen burdens on healthcare systems. The general public and the elderly should be

encouraged to follow advice from Public Health England and remain taking supplements containing 10 µg of vitamin D daily, considering that low vitamin D status seems to be linked with decreased immune function [19]. Family and friends should assist to convey this information to older cohorts since they may have inadequate awareness of these guidelines. Foods that are naturally rich in vitamin C such as broccoli (60 mg/100 g), blackcurrants (130 mg/100 g), fortified breakfast cereals (up to 134 mg/100 g) and oranges (37-52 mg/100 g) should be made available to older people who require their nutritional benefits most [20]. The consumption of foods naturally rich in zinc such as canned crab (5.7 mg/100 g), canned shrimps (3.7 mg/100 g), canned adzuki beans (\approx 2.3 mg/100 g) and boiled eggs (1.3 mg/100 g) should be encouraged as a supplementation approach to strengthen immunity. Amongst those with established respiratory conditions or pneumonia, certain nutrients such as vitamin C, vitamin D or zinc can be considered as potential adjuvants to conventional treatment. Now, that a pandemic has emerged with SARS-CoV-2, and considering the deliberated nutrients are low cost, low side effects and easily available, now could be a suitable time to trial and test their effectiveness in regards to prevention, severity and recovery of such infections. Ongoing research is urgently required within the area of immunonutrition particularly how this could benefit susceptible, at risk groups [21].

Concluding Remarks

As a whole, Malaysians particularly the ageing population that are more at risk should consider to advocate immunonutrition by consuming more foods naturally rich in vitamin C and zinc as a supplementation approach to strengthen our immunity during this pandemic. Besides that, the general public and ageing population should also consider taking supplements that could reinforce immunity apart from our daily diet. These are good efforts to be vigilant in facing the Covid-19 pandemic towards achieving United Nations' Sustainable Development Goal (SDG) No. 3 which is global well-being and good healthcare for all.

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