Editorial:

Trace Elements Association with COVID-19

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> "*A balanced diet and supplementation with proper nutrients may play a vital role in prevention, treatment, and management of COVID-19*" [1].

The current global pandemic of COVID-19, caused by severe acute respiratory syndrome (SARS) coronavirus 2 (SARS-CoV-2), has already infected 101561291 individuals and has claimed about 2196944 lives in about 223 countries of our planet till today, January 31, 2021, [2-5]. COVID-19 is a potentially fatal disease in severe cases and speedily led to global public emergency and concern for every nation of the globe [5, 6]. Therapeutic management of COVID-19 has been a critical issue for physicians because of the novel and unknown nature of the disease as encountered by mankind. The exact pathological basis of this disease is yet to be explored. Due to the same fact, to date, we do not have any fully approved specific medicine or vaccine to address the disease [7, 8]. Currently, mankind is combating COVID-19 by utilizing older medicines approved for other indications through repositioning or repurposing to find an answer for this disease [9-11]. Additionally, several studies reported that dietary manipulation positively impacts health and can prevent COVID-19 infection[12-14]. Equivocally, both nutritional superfluous intake and deficit of nutrients are related to low immune status [15-17].

Optimum levels of macronutrients, micronutrients, and energy sources are indispensable and have an influential role in every aspect of maintaining a healthy immune system [18, 19]. Micronutrients play an essential role in innate immunity by conserving the mechanical and efficient integrity, such as skin and mucus membranes[18, 20]. Micronutrients positively affect the supportive activity of antimicrobial proteins and chemotaxis among innate immune cells [18]. Additionally, many vitamins (A, D, C, E, B6, and B12, folate) and minerals (zinc, iron, magnesium, copper, fluoride, chromium, iodine, manganese, molybdenum, and selenium) play significant roles to promote the innate and adaptive immune systems. Thereby, micronutrients and trace elements offer added synergistic outcomes to potentiate the effects of neutrophils and macrophages [20-24].

Furthermore, the population-based research reveals that consumption levels of pertinent micronutrients-especially vitamin D, C, B12, and iron are inversely associated with COVID-19 incidence and/or mortality, predominantly in people genetically susceptible to display lower micronutrient status [25]. Additionally, the non-interventional and non-experimental studies, and clinical trials, quantified that vitamins A,

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C, and D, omega-3 fatty acids, and zinc have an imperative role in enhancing immunity [26-29]. Besides, the current global pandemic increases the possibility of added worsening effect of nutritional status during lockdown (to prevent transmission of COVID-19 virus), which has a significant influence on the health system of low and middle-income countries (LMICs) [30-32]. Around 70% of mortality in LMICs is due to diet-correlated Non-Communicable Diseases (NCDs) misery, and it remains indeed an ongoing public health challenge [29, 33]. Thereby, COVID-19 imposes additional public health challenges. Multiple studies reported that enhancing our immune system remains one of the best strategies to combat COVID-19 [34-39]. Zinc has been known as one of the most indispensable trace elements to accomplish this thought-provoking intention in managing COVID-19. It is because zinc possesses antiviral property in mammalian cells [29, 37, 38]. Zinc displays a spectrum of physiological roles; these include several enzymes and protein activation, maintaining normal health, and managing immune-related issues [39, 40].

Additionally, vitamin A, E, and folate absorption are dependent on adequate availability of zinc [37, 41]. These vitamins are an essential requirement to develop immunocompetence [19]. Nevertheless, the resistance of human being against the virus although has several determinants yet a competent immune system to an extent depends upon on the availability of micronutrients and trace elements, including vitamins A, C, D, E, B6, B12, folate, iron, zinc, copper, selenium, and magnesium [21, 42]. Micronutrients and trace elements have a broad spectrum of activities in influencing immune physiology of both innate and adaptive immunity, "including differentiation, proliferation, and functions of T-cells, the interactions with the presenting viral antigens the production development of virus-specific antibodies" [43]. However, micronutrients and trace elements work synergistically regarding virus-host responses. Nonetheless, one particular nutrient deficiency increases the possibility of severe COVID-19 infection [21, 42, 44]. [Figure 1]

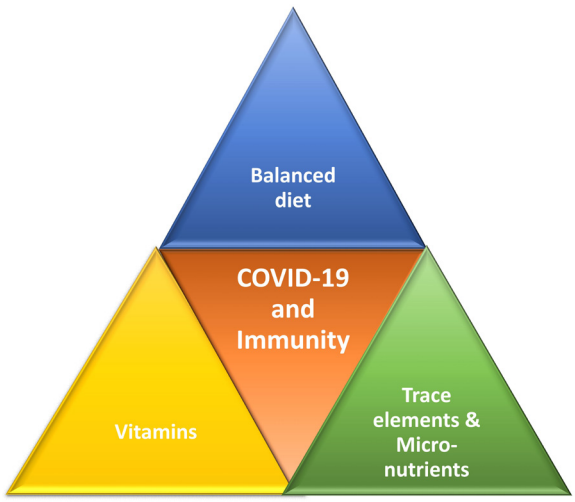

Figure 1: Illustrating COVID-19 Association with Balanced Diet, Vitamins, Trace Elements, and Micronutrients to Augment Immunity.

Angiotensin-converting enzyme 2 (ACE2) has a spectrum of biological activity: a negative regulator of the renin-angiotensin system, facilitator of amino acid transport, and the severe acute respiratory syndrome-coronavirus (SARS-CoV) and SARS-CoV-2 receptor [45]. On the other hand, dietary practices have a robust consequence on ACE levels. A diet containing high-saturated fat increases ACE serum level [46, 47]. Multiple studies have revealed comprehensive dietary programs that include bioactive [food-derived angiotensin-converting enzyme inhibitory (ACEI)] peptides and ACE-inhibitory activity [48-51]. It has been reported that milk, eggs, fish, meat, and plants with milk and dairy proteins possess a significant quantity of bioactive ACE inhibitory peptides [52, 53].

Furthermore, blood levels of ACE are exceedingly and promptly sensitive to dietary intake [46, 47]. The World Health Organization (WHO) has broadcasted nutritional strategies for the period of the COVID-19 plague, emphasizing the necessity of a balanced diet to preserve and promote a resilient immune system and evade or abate chronic disease infections [54]. Stimulatingly, WHO recommended dietary intervention strategy to be an enhanced version of the standard plan of a balanced diet to combat COVID-19 infection [55]. Hence, indeed, a balanced diet (ensures all necessary vitamins, micronutrients, minerals, trace elements) is a significant issue to prevent COVID-19 infection and several non-communicable chronic diseases [56-58]. Thereby, it reduces both morbidity and mortality [56].

Consent for Publication

All authors reviewed and approved the final version and have agreed to be accountable for all aspects of the work, including any issues related to accuracy or integrity.

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