



# Coronavirus Disease 2019 “Covid-19” and Its Relation to Food

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## ABSTRACT

Coronaviruses belong to the order Nidovirales and have families such as Coronaviridae, Arteriviridae, and Roniviridae. Coronavirida has two subfamilies named Coronavirinae and Torovirinae. Alpha, beta, gamma, and delta are also four groups of the Coronavirinae subfamily. All viruses belonging to the order Nidovirales are coated and positive-sense single-stranded RNA with a viral genome length of 27 to 34 kilobases. The particles are composed of 20-nm-diameter polymers that resemble a solar corona or a royal corona in the view of electron microscopy, which is why members of the family have named it Coronavirus. In this review article, we briefly describe coronaviruses, how they spread, the pathogenicity, current prevention and treatment strategies, and the association and effect of food with the virus.

**Key Words:** COVID-19, Coronaviruses 2019, Nidovirales, Torovirinae, positive-sense RNA

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## INTRODUCTION

The novel infection of coronavirus 2019 or nCOV-2019 was detected in December 2019 in Wuhan, China, and spread rapidly throughout China and then briefly around the world [1-8]. Because the virus has quickly affected all countries, it has become a global concern and has become a major concern for the World Health Organization. The World Health Organization (WHO), on February 11, 2020, named this virus nCOV-2019 or COVID-19 acute respiratory syndrome (SARS-CoV-2), has been reported [3]. Initial studies indicate that the virus has been transmitted from animal to human and has gradually spread from human to human through direct contact with droplets dispersed in the air through sneezing [8]. Evidence has also shown that this infection can be transmitted very quickly, even asymptomatic, from human to human [9, 10], and unfortunately, it can be said to have a high potential for epidemics [5, 11, 12] and Traveling can further spread the disease worldwide [10]. Therefore, governments and people must work globally to prevent further spread of the disease.

## Corona Virus 2019

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In addition to seasonal flu, other pathogens of pneumonia such as:

adenovirus, Coronavirus 229E / NL63 / OC43, human bocavirus, human metapneumovirus, parainfluenza virus 1/2/3, Rhinovirus, and respiratory syncytial virus A / B It has also been reported that these viruses can also cause a common infection in the community [13, 14].

In terms of classification, Coronavirus is a member of the sub-genus Sarbaco virus (B domain of Beta-CoV) and of the ortho-corona virus family. The new Coronavirus, known as SARS-Covi-2 (due to its close association with SARS coronavirus) or COVID 19 (nCoV-2019) or acute respiratory disease ANC-2019 (nCoV-acute respiratory disease) that has infected humans and has the highest mortality rate than other members of this family [15].

Phylogenetic analysis showed that SARS-CoV-2 (similarity 88-89) is very similar to two virus crowns, such as bat-SL-CoVZC45 and bat-SL-CoVZXC21 but similar to SARS-CoV (approximately 79% similarity). And the Middle East Coronavirus Respiratory Syndrome (MERS-CoV) (50% similarity) is less similar [16-18]. SARS-CoV-2 is likely a new virus that has been transmitted to humans independently from animals because it resembles the



circulating Coronavirus in *Rhinolophus* [19] and according to genomic research findings, Researchers believe that despite some bats and animals alive in the Wuhan seafood market, SARS-CoV-2 may have spread through bats or drowning caused by contaminated substances in the market or surrounding area [17, 20].

In terms of classification, Coronavirus is a member of the sub-genus Sarbeco virus (B domain of Beta-CoV) and of the ortho-corona virus family. The Coronaviridae family, a family of coated viruses, are positive, single-stranded RNAs with a viral genome length of 1 to 2 kb. These particles are usually adorned with a petal or petiole-shaped up to 2 nm (pellomer or thorn), which in the view of electron micrographs are reminiscent of planar particles in the form of a solar corona or a royal crown, and therefore members of this family are called coronaviruses (viruses Crowns) are known. The Coronavirus family consists of 3 subfamilies, 1 subgroup, 1 subgroup, and 1 species. Coronaviruses were discovered in year 4 and continued to be studied until the mid-decade. Although coronaviruses are most commonly seen in animals, so far, seven human coronaviruses have been discovered, but so far, seven human virus viruses have been found to infect humans, but the new Coronavirus has the highest mortality rate than other members of the family. Seven strains of human Coronavirus identified so far:

1. Human Coronavirus (HCoV-229E)
2. Human Coronavirus (HCoV-OC43)
3. Coronary Acute Respiratory Syndrome Virus 1 (SARS-CoV-1)
4. Human Coronavirus (HCoV-NL63), discovered in 2004
5. Human Coronavirus (-HKU1 HCoV), discovered in 2005
6. Coronavirus related to the Middle East Respiratory Syndrome, formerly known as Coronavirus 2012 or MERS or HCoV-EMC (MERS-CoV).
7. Acute Respiratory Syndrome 2 (SARS-CoV-2), also called Corona Virus 2019 (2019-nCoV).

Viruses No. 1, 2, 4, and 5 regularly cause disease in the human population and cause respiratory infection in children and adults [21].

### **The origin of coronaviruses and its symptoms**

The Coronavirus is capable of infecting birds and mammals. The virus, after Rhinovirus, is the most common cause of colds and has moderate pathogenic potential but can sometimes cause more severe conditions, such as Middle Eastern Respiratory Syndrome or MERS and Acute Respiratory Syndrome or SARS. The two viruses were transmitted to the human form one camel to the other, respectively, from a cat. These two viruses have the potential to cause intestinal infections in infants and, in rare cases, nervous system syndromes. The Coronavirus is said

to cause more than half of the colds in children and adults and has symptoms such as fever, dry cough, and adenoid swelling in winter and early spring. Coronaviruses can cause bronchitis (direct viral bronchitis or indirect bacterial bronchitis) and pneumonia (the primary cause of viral pneumonia or secondary cause of bacterial pneumonia). The biggest human infection of the Coronavirus was in 2003 (coronavirus SARS), which caused acute inflammation of the respiratory system. But for some people, Covid-19 can cause complications such as pneumonia, lack of oxygen, and even death. However, researchers have found that the new Coronavirus is less risky than SARS and has been severely affected in 2 to 5 percent of cases, with mortality rates ranging from 2 to 5 percent [5].

The Coronavirus binds to the host cell surface glycoproteins through connections between viral glycoprotein spines. Some coronaviruses bind to sialic acid glycoproteins and glycolipids through thorns or hemagglutinin glycoproteins. Interactions between the coronavirus and host cell receptors, the degree of specialization and tissue proliferation, determine the virulence of the virus. The virus affects the respiratory tract and causes symptoms similar to the common cold that can cause bronchitis and pneumonia in children and the elderly, immunocompromised, or weakened immune systems or people with underlying or specific diseases. According to researchers and physicians, Symptoms of the disease include fever (43.8% at admission and 88.7% at admission), dry cough (67.8%), respiratory disorder, fatigue, and muscle pain (in 11% to 14% cases), diarrhea (in 3.8% of cases). Symptoms of a new coronavirus usually begin between 1 and 2 days after the person is infected, and in some people, the symptoms may appear a little later. The average duration of symptoms is four days. Ground-glass opacity was found in 56.4% of chest CT scans, and in 9.17% of patients with mild symptoms and 2.9% of patients with severe symptoms, no chest CT scan was found. Lymphopenia (decreased circulating lymphocyte count) was observed in 83.2% of patients at admission, some with mild symptoms and some without symptoms [21].

### **Clinical presentation of 278 Chinese patients with coronavirus 2019**

In this section, we summarize the clinical presentation of 278 Chinese patients with 2019 coronavirus. All patients were over 18 years old, and 61.9% were male (172 patients). The most common underlying disease was cardiovascular disease, hypertension, and diabetes, and the most common clinical information was fever (92.8% equivalent to 258 patients), cough (69.8% equivalent to 194 patients). Dyspnea (34.5% equivalent 96 patients), myalgia (27.7% equivalent 77 patients), headache (7.2% equivalent 20 patients), diarrhea (6.1% equivalent 17 patients), rhinorrhea (4.0% equivalent 4 patients), sore throat (5.1% equivalent 4

patients) and pharyngalgia (17.4% equivalent 8 patients). These patients had a normal white blood cell count, and only 56.8%, equivalent to 158, had leukopenia [22].

Researchers have suggested that older people and people with underlying diseases significantly need intensive care [8]. It has also been reported that patients admitted to the ICU ward were more likely to have shortness of breath than patients who were not in the ICU [5, 8].

In a study in 2020, researchers reported that among 13 children with coronavirus 2019, 2 were aged between 2 and 15 years [23]. There were also more than 20 cases identified in Zhejiang Province of China, ranging in age from 3 months to 17 years [24]. Thirteen patients with coronavirus 2019 were reported in Beijing, 12 of whom (92.3%) had a fever before being admitted to hospital, and other symptoms such as upper airway congestion (61.5%), cough (46.3%), They had a headache (23.1%) and myalgia (23.1%) [23]. The researchers said there was still uncertainty about the symptoms of the disease, and more studies were needed.

### How to diagnose patients

A definitive diagnosis of Coronavirus should also be performed using PCR on two specimens, one from the upper respiratory tract (such as the pharynx or nose) and the other from the lower respiratory tract (such as sputum or sampling during a lung wash). Generally available within a few hours to two days. A blood test can also be used but requires two blood samples were taken two weeks apart [25].

Researchers and doctors reported variable findings in patients with coronavirus 2019. In a study of 51 people with coronavirus 2019, 86% had lung involvement on both sides of the lungs, and most showed a clear CT scan (77%) of GGO (Ground-glass opacity) and then GGO with reticular and / or interlobular septal thickening (75%), GGO with consolidation (59%) and pure consolidation (55%) It was shown [26]. Another report showed that 75% of patients with bilateral lung involvement [4, 5, 8, 27].

The most common finding shown on computed tomography was GGO [8, 22]. In another study of 21 patients, 86% of patients had GGO on chest CT scan, and 29% showed consolidation [26]. In another study, one-third of patients showed a peripheral distribution of GGO, but in contrast, no discrete nodules, cavitation, pleural effusion, or lymphadenopathy was observed in patients' chest CT scans [28, 29].

### Treatment claims

There is still no effective treatment for COVID-19, but the following reports have been obtained from various researchers:

- 85% of patients used antiviral medications prescribed by physicians for treatment. These include ganciclovir (0.25 g intravenously every 12 hours), lopinavir / ritonavir tablets (100/400 mg-twice daily orally), and

oseltamivir (75 mg orally every 12 hours) and experimental antibiotics for 90% of patients [4, 5, 8].

- Use of antifungal drugs for 15 patients [4].
- Intravenous immunoglobulin and systemic steroids (efficacy but unknown side effects of this procedure) [4, 5, 8].
- Medications: DNA synthesis inhibitors (such as lamivudine and tenofovir disoproxil), neuraminidase inhibitors, lopinavir / ritonavir (Kaletra®), umifenovir (Arbidol R®), nucleoside analogues, remdesivir. Chloroquine and Chinese traditional medicines (such as ShuFeng JieDu or Lianhua Qingwen capsules) have been proposed [29, 30].
- Remdesivir and chloroquine (very effective for controlling 2019-nCoV in vitro) [30].
- Des Remdesivir [7].

Overall, in scientific and medical studies, scientists and researchers have found that AIDS drugs such as lopinavir / ritonavir have been useful in treating and preventing the progression of Coronavirus and even the treatment of this disease in some patients, and collectively show evidence Viral antiviral drugs have been shown to save the lives of many people with Coronavirus.

### Control and prevention methods

There is no clear cure for the virus at this time, but investigations are ongoing. In order to prevent the spread of Coronavirus in the world and reduce its damage, we need to take serious health measures [26].

The early experience of this pneumonia has shown that chest radiography can be very effective for early detection and separation of affected individuals from healthy individuals [31].

According to previous WHO experience, in order to manage the acute respiratory infections of MRES and SARS, to reduce the overall risk of transmitting these diseases, direct contact with patients and even their environment should be avoided, avoiding unexpected contact with animals, and of course, The best way to prevent this disease is to avoid contact with infected people and objects, to avoid contact with the face (eyes, mouth, and nose) and to wash hands with soap and water (at least for 2 seconds), using disposable masks. (Which should be completely covered on the mouth and nose of the person and replaced every day), Use latex gloves outdoors, distance (1.5-1.3 m) People with cough, sneezing and runny nose, as well as keys and cell phones, door and car handles should be regularly disinfected with an alcohol pad or disinfectant solution and, of course, boost the immune system by consuming it. Citrus fruits, adequate sleep, and rest and exercise are effective [15].

Using Coronavirus 2019 Methanol, we can use surfactants: 62-71% ethanol, 0.5% hydrogen peroxide, and 0.1%

sodium hypochlorite per day using protective and environmental methods: benzalkonium chloride 0.2-0.5 % Or chlorhexine digluconate 0.02% room area [32].

### Unsolved Information

With the worldwide effort to see Coronavirus 2019, it has made it possible for you to keep track of:

- Corona correction in the patient's stool [7]
- Coronavirus transmission from fecal-oral route guide [32, 33]
- Coronaviruses survive on surfaces and inanimate objects [32, 33]
- Transmission of Coronavirus by air
- Definitive teaching method

### Viruses in Food

The viruses most often concerned in foodborne infections are Norovirus (NoV), and Hepatitis A virus (HAV), however different viruses like Human Rotavirus (HRV), Hepatitis E virus (HEV), Astrovirus, Aichi virus, Sapovirus, Enterovirus, Coronaviruses (CoV), Parvovirus and Adenovirus also can be transmitted by food, and anecdotal evidence suggests the list of foodborne viruses maybe even longer. These viruses, as mentioned, can resist (mild) food production processes routinely used to inactivate or control bacterial pathogens in contaminated foods. Additionally, some viruses could sometimes be transmitted via food, though their typical mode of transmission is entirely different, as has been documented for Severe Acute Respiratory Syndrome (SARS)-causing Coronavirus (SARS-CoV). Some noteworthy characteristics of foodborne viruses and therefore, the associated infections and illnesses are listed below:

- Viruses got to enter living cells to be able to replicate. In distinction to microorganisms, they are going to never replicate in food. Consequently, viruses will never cause deterioration of the food product, and conjointly the organoleptic properties of the food will not include amendment due to microorganism contamination.
- Only some viral/infectious particles area unit needed to cause infection and manufacture malady. (1 to 100)
- Viruses transmitted by the fecal-oral route are shown to be hardy and to act the surroundings. Most foodborne viruses do not have associate envelope and area unit so quite stable outside of the host and demonstrate resistance to the extremes of hydrogen ion concentration (acid and alkaline), drying, radiation, etc.
- The transmission of zoonotic viruses via food, as is common for several microorganism pathogens, e.g., *Salmonella* and *Campylobacter* spp. is rare for viruses [34].

Foodborne contamination is additionally the result of infected food handlers who unwittingly transmit their infections to food. Because viruses typically cause through secondary unfold, so that is a smaller quantity typical for the well-known microorganism pathogens like *Salmonella* and *Campylobacter*. These properties of foodborne viruses make new challenges for risk managers. It is necessary to note that there area unit evident variations in morphology, infectivity, persistence, and epidemiology between viruses, and conjointly the common foodborne microorganism. Management of microorganism hazards typically needs measures completely different from those usually utilized to combat microorganism hazards. Therefore, a vital thought for risk managers is that current food hygiene guidelines that are optimized for hindrance of microorganism infections might not be practical for viruses [34].

Also, the possible for foodborne transmission is a priority with each new showing infection and ruling out such problems be often troublesome. Though initially considered to be far, fecal-oral unfolds, especially conditions, have been assayed for the primary metabolic process pathogens like SARS-CoV. Infectious avian influenza virus has been cultured from frozen exported meat, raising questions on the possible dissemination of such viruses by the food chain. This mode of spread is taken into consideration to be rare, although the potential consequences of such unfold dictated that such viruses be thought of by the meeting [34].

### Is there any case report relating to food impact in Coronavirus?

Although CoV disease 2019 (COVID-19) is suspected to originate from an associate animal host (zoonotic origin) followed by human-to-human transmission, the possibility of different routes like foodborne transmission must not be dominated out. Compared to diseases caused by previously known human CoVs, COVID-19 shows a less severe pathologic process, however higher transmission competency, as is evident from the unendingly increasing range of confirmed cases. Compared to different rising viruses like Ebola virus, avian H7N9, SARS-CoV, or MERS-CoV, SARS-CoV-2 has shown comparatively low pathogenicity associated moderate transmissibility sequence usage studies counsel that this novel virus may are transferred from an animal source like bats [35]. Previous experience with outbreaks of disease due to MERS-CoV, SARS-CoV, and other respiratory viruses (like avian influenza) counsel that novel coronavirus may are transmitted from animals to humans. As Food standard Australia mentioned, transmission through food is unlikely, and there is no proof of this occurring with novel coronavirus so far; however, investigations into but, the virus spreads area unit continued. As the National Law Review declared, whereas Coronavirus is not spread through food, the trade should

mitigate against the substantial risks concerning the close contact between possibly-infected food service workers, the food being prepared, and conjointly the end consumer. The shortage of health-related benefits traditionally created offered to food preparation workers solely amplifies the priority. European Food Safety Authority (EFSA) is closely observance true concerning the irruption of coronavirus disease (COVID-19) that is affecting an oversized range of nations across the world and mentions there is presently no proof that food is also a potential source or route of transmissions of the virus [36].

### **Influence of Micronutrients in Coronavirus**

The Coronavirus presents several uncertainties, and none of the individuals can completely eliminate our risk of obtaining COVID-19. However, one factor we will do is eat as healthily as possible, like previously known respiratory infections. When we do catch COVID-19 or other respiratory infections, our immune system is accountable for overcoming it. Research shows rising nutrition helps support optimum the act of immune. The essential Micronutrients to overcome the infection, include vitamins A, B, C, D, and E, and also the minerals zinc, iron, and selenium have an important factor. Dr. Collins clearly states regarding the Influence of micronutrients in Coronavirus and that we should understand, however these nutrients support our system, and conjointly the foods we will eat to get them.

- **Vitamin A**

It maintains the structure of the cells within the skin, especially respiratory tract and gut. This forms a barrier and is your body's preliminary line of defense. We tend to conjointly would like Vitamin A to assist antibodies that neutralize the pathogens that cause infection. Vitamin A is observed in egg yolks, oily fish, cheese, nuts, seeds, and also whole grains and legumes that we will take it in daily meals. In addition, some vegetables contain provitamin A (beta-carotene), which your body will change into vitamin A. Also, beta-carotene is found in yellow, orange vegetables (like pumpkin and carrots) and leafy green vegetables (like legumes) [37].

- **B vitamins**

B vitamins contribute to your body's initial response once; it has identified a pathogen. They are considerably B6, B9 (folate) and B12 (cyanocobalamin), doing this by influencing the assembly and activity of "natural killer" cells. Natural killer cells work by inflicting infected cells to "implode", a process is known as apoptosis. Fish is also a sensible supply of vitamin B complex. Conjointly it is found in vegetable sources like legumes, cereals, leafy green vegetables, fruit, nuts, and also in animal supply such as fish, chicken, and meat. B9 is superabundant in leafy

green vegetables (such as legumes, nuts, and seeds) and is else to industrial bread-making flour. B12 is found in the animal product, as well as eggs, meat, and dairy, and conjointly in fortified soy milk [37].

- **Vitamins C and E**

The important role of vitamin C and vitamin E is to facilitate defend cells from oxidative stress. Your body experiences oxidative stress when is overcoming an associate infection. Oxidative stress ends up in the assembly of free radicals, which might pierce cell walls, inflicting the contents to leak into tissues and aggravating inflammation. In addition, vitamin C helps mop up this cellular mess by producing specialized cells to mount an immune response, as well as neutrophils, lymphocytes, and phagocytes. We are able to take Vitamin E from food sources (including nuts, green leafy vegetables, and vegetable oils). Good sources of water-soluble vitamin is found in fruits and vegetable (oranges, lemons, berries, kiwifruit, broccoli, tomatoes) [38].

- **Vitamin D**

Vitamin D helps Some immune cells due to destroy pathogens that cause infection. Though when the body exposure to the sun produces vitamin D, we can take it food sources, including fish, eggs, and some milk, and margarine may even be fortified with Vitamin D (meaning further has been added). The majority need just a few minutes outdoors most of the days. People with a lack of vitamin D may need supplements. A review of 25 studies found vitamin D supplements facilitate defend against acute respiratory infections, notably among people who are deficient [37].

- **Minerals iron, zinc, selenium**

Iron helps kill pathogens by enhancing the number of free radicals that may destroy them. It conjointly regulates enzyme reactions essential for immune cells to acknowledge and target pathogens. The body needs iron, zinc, and selenium for immune cell growth, among different functions. It worth mentioning whole grain foods contain a range of variety a range of necessary nutrients. Zinc helps maintain the integrity of the skin and mucous membranes. In addition, zinc and selenium serving to clean up a variety of damage caused by oxidative stress and act as an antioxidant. Iron is found in chicken, meat, fish, and also in Vegetarian sources, which include legumes, whole grains, and iron-fortified foods. A sensible source of zinc is oysters and other seafood, meat, chicken, dried beans, and nuts. Also, Foods include nuts, meat, cereals, and mushrooms are good sources of selenium [38]. Note that in both normal and emergency situations, it is necessary to maintain balance and variety in the consumption of all foods. Get all the vitamins you need to boost your immune system and stop sickness and improve your nutrition, and foods that have

vitamins and minerals have not any preference. Do not recommend taking all supplements in these situations as a result of taking high doses of vitamins and minerals has no proved protecting impact in preventing infectious diseases. The complementary assistance program should only be carried out on the basis of a national action plan.

### **The clinical effect on lack Micronutrients**

Reduce resistance to infections and also enhance the severity of symptoms as a result of the lack of intake of micronutrients at any stage of life, which are affects numerous functions in the immune system. For instance, lack of zinc may, thymic atrophy, oxidative stress, and inflammation are enhanced by altering cytokine production, decrease lymphocyte range and activity [39], or vitamin C would possibly increase oxidative damage [40]. Enhanced outbreak and severity of pneumonia and different infections [40, 41]. Reduced resistance to infection and cancer, Reduced delayed-type hypersensitivity reaction, impaired wound healing and concerning its supplement, antioxidant attributes defend leukocytes and lymphocytes from oxidative stress [42] For elderly people possible reduction in an incidence and period of pneumonia [41] For Children: reduced period and severity of respiratory disease signs [43]; amended outcomes in pneumonia, malaria, and diarrhoeic symptoms. As a result, Increased the risk of all types of infection (bacterial, viral, and fungal), however particularly diarrhea and pneumonia [44]. When less vitamin C situation, conjointly, will increase susceptibleness to infections like pneumonia [45], in all probability, as a result of low levels of antioxidants like vitamin C, could not counteract the oxidative stress distinctive in pneumonia [40]. Enhanced production of ROS throughout the immune reaction to pathogens would possibly reduce vitamin C levels extra [43]. The lack of Vitamin D also increases the risk of infection and autoimmune diseases like multiple sclerosis and diabetes by the activity of vitamin D receptors [46, 47]. Micronutrients in immunity have considering the role and therefore, the proven fact that the majority of all ages have single or multiple lacks of micronutrient which will have impacts on damaging immunological, a rule for restore micronutrient supplementation to concentrations that suggested levels, particularly when associate infection, and to help immune function and maintenance. Actually, it is necessary to confirm that supplementation does not overpass recommended tolerable upper intake levels, the highest level of daily nutrient intake that is likely to create no risk of adverse health effects in the majority, and stopped any unwanted side effects [48]. Although the exception to vitamin A in children, there is reported micronutrient intake recommend that over-supplementation is unlikely with most micronutrients. It should be noted that the safety margins in micronutrient supplements ensure that

consumption does properly not lead to over-supplementation and which food supplement labels ought to be carefully read to prevent misuse, and therefore, the potential for over-supplementation. There is not any single biomarker exists that exactly reflects the impacts of supplementation on the immune reaction, instead, clinical outcomes are used to determine the effectiveness of supplementation [44, 49]. Even so, current information concerning the importance of micronutrients in immunity, the influences lack micronutrient on the risk and severity of infection, and therefore, the worldwide epidemic outbreak of an insufficient micronutrient position form is good for the utilization of targeted multiple micronutrient supplements to protect immunity over people's lifetime. All age groups have been reported to be affected by the Coronavirus, however elderly and immune deficiency individuals are at greater risk of developing it. Therefore, taking care of them and preventing them is entirely essential. Relating to the complications of Coronavirus, nutritional recommendations for prevention and management of the disease are as follows:

- **The clinical effect on lack Micronutrients to Adults**

Vitamin C supplements lead to reduces the period and severity of common cold signs in adults [43]. When you are in those beneath physical stress (e.g., at work, throughout sports, and under extreme temperatures) [40] or in cases wherever levels of vitamin C are somewhat below suggested levels, vitamin C supplements lead to reduce respiratory disease occurrence.

For instance, young males who have marginal vitamin C shortage reported that supplement was shown to reduce the incidence of the common cold and, therefore, the period of cold signs compared with placebo, accompanied by improved activity levels [50]. Vitamin C supplementation Once used in combination with zinc will relieve symptom like in the respiratory illness [51], that is somewhen thought-about as the most often and severe symptoms of the infection (along with nasal congestion) [52]. Vitamin D Supplement can protect against respiratory tract infections and reduce the risk of acute respiratory illness and influenza, particularly in cases with once-daily dosing [53, 54]. Advantages are particularly obvious in those who are lack of vitamin D [54]. Due to their positive influences on respiratory tract infections, it is suggested there is an excellent rationale to add vitamins C and D with Zinc to protect immune functions and reduce the risk of infection [45]. Supplementation with multiple micronutrients has beneficial influences on the symptoms relating to the known, "sick building syndrome," associated with the extended contact with environmental factors that act as vehicles for pollutants. Considerably fewer adults who received the micronutrient supplement reportable headache, sore eyes, nasal congestion, throat inflammation, tiredness,

diarrhea, or symptoms related to an acute respiratory tract infection, like cough [55].

- **The clinical effect on lack of Micronutrients to elderly people**

There is Impaired immunity in some elderly people that typically as a result my lack of multiple micronutrients, is obvious within the inflated occurrence and severity of common infections that have an impact on the higher and lower respiratory tracts, besides as a result of the urinary and genital tracts [56, 57]. Intake the modest amounts of a mixture of micronutrients with supplementation, which will have beneficial impacts [56]. Higher levels of CD4+ and CD8+ T cells and an enhanced lymphocyte proliferative response to mitogens are determined by vitamin A, C and E supplements [58], whereas micronutrient supplementation with higher levels of vitamins C, E and beta-carotene accumulated the number of varied subsets of T-cells, enhanced lymphocyte response to mitogen, enhanced IL-2 efficiency and the act of NK-cell, enhanced the response to the influenza virus vaccine, and lead to reduce the period of infection [59]. Supplementation with a complex micronutrient formulation in elderly people inflated the number of varied types of immune cells, besides total lymphocytes, and induced a shift from memory T cells to naïve T cells [60]. Multiple micronutrient supplementation in elderly people may additionally reduce antibiotic usage and result in higher post-vaccination immune responses [56]. Marginal lack of zinc is common in elderly people because their dietary intakes are typically lower, and plasma zinc concentrations decrease with age, for instance, probably related to impaired absorption, the shift in the cellular uptake, and epigenetic dysregulation of DNA methylation or the methionine/transsulfuration way [42]. Supplementation with low to moderate doses of zinc in healthy elderly people will facilitate to restore thymulin activity, Enhance the number of cytotoxic T cells, reduce the number of activated Th cells (which contribute to autoimmunity) and Enhance the cytotoxicity of NK cells [42], immunological advantages that facilitate to reduce the occurrence of infections like respiratory disease, cold sores, and influenza [61], in addition as a result of the incidence and morbidity of pneumonia. [50]. There are some reports that intake a sufficient zinc supply may stop age-related degenerative illnesses together besides infection and cancer [62]. Sufficient intake vitamin C is additionally vital in elderly people and particularly in females, who are at the risk of vitamin C deficiency [63]. Sufficient vitamin C intakes will optimize cell and tissue levels and facilitate to protect against respiratory and general infections (e.g., reduced period and severity of pneumonia) [64], whereas higher levels are needed throughout infection to compensate for the enhanced inflammatory response and metabolic demand elicited by

the pathogen, so facilitate to reduce the period and severity of symptoms. Vitamin E Supplement in elderly people is shown to considerably improve NK cytotoxic activity, neutrophil chemotaxis, and, therefore, the phagocytic response and enhance mitogen-induced lymphocyte proliferation and IL-2 production [65]. Vitamin E conjointly might increase the production of antibodies in response to hepatitis B and tetanus vaccines and improve T-cell-mediated immunity [66]. When vitamin E supplementation intakes in nursing home residents, the risk of higher respiratory tract infections, notably common cold, was considerably lower, though there was no obvious impact on lower respiratory tract infections. However, there is not any reported of all studies in elder people, that helpful influences on respiratory tract infections with vitamin E supplement [67].

## CONCLUSION

There are distinct immune properties throughout every life stage, associated specific factors have an impact different on immune function, and therefore there is a difference within the kind, incidence, and intensity of infections with people's age. A frequent agent throughout life is the requirement for a sufficient supply of micronutrients that play considerable roles in protecting immune function. Note that in both normal and emergency situations, it is essential to hold balance and variety within the consumption of all foods. Get all the vitamins you need to improve your immune system and stop disease and enhance your nutrition, and foods that contain vitamins and minerals have not any preference. Do not recommend taking all supplements in these situations as a result of taking excessive doses of vitamins and minerals has no verified protecting effect in stopping infectious diseases. The complementary help program ought to only be applied on the basis of a national action plan. On the different hand, the spread of coronavirus disease 2019 (COVID-19) has become a clinical threat to the majority of people, and healthcare workers worldwide. However, there is limited knowledge regarding this novel virus. Now the helpful option treatment of antiviral and vaccination are below evaluation and development. What we do presently could be sharply implemented infection control measures to stop the outbreak of SARS-CoV-2 by human-to-human transmission. Public health specialists need to maintain observation of the situation, as a result of the most of the people tend to find out regarding this novel virus, and its related outbreaks, the better we will respond.

## Conflict of Interests

The authors declare that they have no conflicts of interest.

## Ethical Issues

Not applicable.

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### REFERENCES

- [1] Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *Journal of medical virology*. 2020 Apr;92(4):401-2.
- [2] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KS, Lau EH, Wong JY, Xing X. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *New England Journal of Medicine*. 2020 Jan 29.
- [3] Gorbalenya AE, Baker SC, Baric R, Groot RJ, Drosten C, Gulyaeva AA, Haagmans BL, Lauber C, Leontovich AM, Neuman BW, Penzar D. Severe acute respiratory syndrome-related coronavirus: The species and its viruses—a statement of the Coronavirus Study Group.
- [4] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*. 2020 Feb 15;395(10223):507-13.
- [5] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The lancet*. 2020 Feb 15;395(10223):497-506.
- [6] Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. *The Lancet*. 2020 Feb 15;395(10223):470-3.
- [7] Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, Spitters C, Ericson K, Wilkerson S, Tural A, Diaz G. First case of 2019 novel coronavirus in the United States. *New England Journal of Medicine*. 2020 Jan 31.
- [8] Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *Jama*. 2020 Mar 17;323(11):1061-9.
- [9] Zhao S, Lin Q, Ran J, Musa SS, Yang G, Wang W, Lou Y, Gao D, Yang L, He D, Wang MH. Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak. *International journal of infectious diseases*. 2020 Mar 1;92:214-7.
- [10] Biscayart C, Angeleri P, Lloveras S, Chaves TD, Schlagenhauf P, Rodríguez-Morales AJ. The next big threat to global health? 2019 novel coronavirus (2019-nCoV): What advice can we give to travellers?—Interim recommendations January 2020, from the Latin-American society for Travel Medicine (SLAMVI). *Travel medicine and infectious disease*. 2020 Jan;33:101567.
- [11] Carlos WG, Dela Cruz CS, Cao B, Pasnick S, Jamil S. Novel Wuhan (2019- nCoV) coronavirus. *Am J Respir Crit Care Med* 2020;201:P7–8. doi: 10.1164/rccm.2014P7 .
- [12] Munster VJ, Koopmans M, van Doremalen N, van Riel D, de Wit E. A novel coronavirus emerging in China—key questions for impact assessment. *New England Journal of Medicine*. 2020 Feb 20;382(8):692-4.
- [13] Lee KH, Yoo SG, Cho Y, La Y, Han SH, Kim MS, Choi JS, Kim SI, Kim YS, Min YH, Cheong JW. Characteristics of community-acquired respiratory viruses infections except seasonal influenza in transplant recipients and non-transplant critically ill patients. *Journal of Microbiology, Immunology and Infection*. 2019 Jun 19.
- [14] Su IC, Lee KL, Liu HY, Chuang HC, Chen LY, Lee YJ. Severe community-acquired pneumonia due to *Pseudomonas aeruginosa* coinfection in an influenza A (H1N1) pdm09 patient. *Journal of Microbiology, Immunology and Infection*. 2019 Apr 1;52(2):365-6.
- [15] World Health Organization. Novel Coronavirus ( 2019-nCoV): situation report, 3.
- [16] Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, Wang W, Song H, Huang B, Zhu N, Bi Y. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *The Lancet*. 2020 Feb 22;395(10224):565-74.
- [17] Jiang S, Du L, Shi Z. An emerging coronavirus causing pneumonia outbreak in Wuhan, China: calling for developing therapeutic and prophylactic strategies. *Emerging microbes & infections*. 2020 Jan 1;9(1):275-7.
- [18] Ren LL, Wang YM, Wu ZQ, Xiang ZC, Guo L, Xu T, Jiang YZ, Xiong Y, Li YJ, Li XW, Li H. Identification of a novel coronavirus causing severe pneumonia in human: a descriptive study. *Chinese medical journal*. 2020 Feb 11.
- [19] Chen L, Liu W, Zhang Q, Xu K, Ye G, Wu W, Sun Z, Liu F, Wu K, Zhong B, Mei Y. RNA based mNGS approach identifies a novel human coronavirus from two individual pneumonia cases in 2019 Wuhan outbreak. *Emerging microbes & infections*. 2020 Jan 1;9(1):313-9.
- [20] Zhou P, Lou YX, Wang XG, Hu B, Zhang L, Zhang W. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature [Internet]*. 2020; 579 (7798): 270–3.
- [21] Fehr AR, Coronaviruses PS. An Overview of Their Replication and Pathogenesis. Maier H, Bickerton E,



- Britton P (eds) Coronaviruses Methods in Molecular Biology.;1282.
- [22] Kanne JP. Chest CT findings in 2019 novel coronavirus (2019-nCoV) infections from Wuhan, China: key points for the radiologist.
- [23] Chang D, Lin M, Wei L, Xie L, Zhu G, Cruz CS, Sharma L. Epidemiologic and clinical characteristics of novel coronavirus infections involving 13 patients outside Wuhan, China. *Jama*. 2020 Mar 17;323(11):1092-3.
- [24] Chen ZM, Fu JF, Shu Q, Chen YH, Hua CZ, Li FB, Lin R, Tang LF, Wang TL, Wang W, Wang YS. Diagnosis and treatment recommendations for pediatric respiratory infection caused by the 2019 novel coronavirus. *World journal of pediatrics*. 2020 Feb 5:1-7.
- [25] Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and corona virus disease-2019 (COVID-19): the epidemic and the challenges. *International journal of antimicrobial agents*. 2020 Feb 17:105924.
- [26] Song F, Shi N, Shan F, Zhang Z, Shen J, Lu H, et al. Emerging coronavirus 2019-nCoV pneumonia. *Radiology* 2020 Feb 6 [Epub ahead of print]. doi: 10.1148/radiol.202000274 .
- [27] Ryu S, Chun BC. Epidemiological characteristics of 2019 novel coronavirus: an interim review. *Epidemiology and health*. 2020 Feb 6.
- [28] Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, Cui J, Xu W, Yang Y, Fayad ZA, Jacobi A. CT imaging features of 2019 novel coronavirus (2019-nCoV). *Radiology*. 2020 Apr;295(1):202-7.
- [29] Lu H. Drug treatment options for the 2019-new coronavirus (2019-nCoV). *Bioscience trends*. 2020 Feb 29;14(1):69-71.
- [30] Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, Shi Z, Hu Z, Zhong W, Xiao G. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. *Cell research*. 2020 Mar;30(3):269-71.
- [31] Kim JY, Choe PG, Oh Y, Oh KJ, Kim J, Park SJ, Park JH, Na HK, Oh MD. The first case of 2019 novel coronavirus pneumonia imported into Korea from Wuhan, China: implication for infection prevention and control measures. *Journal of Korean medical science*. 2020 Jan 6;35(5).
- [32] Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *Journal of Hospital Infection*. 2020 Mar 1;104(3):246-51.
- [33] Casanova LM, Jeon S, Rutala WA, Weber DJ, Sobsey MD. Effects of air temperature and relative humidity on coronavirus survival on surfaces. *Applied and environmental microbiology*. 2010 May 1;76(9):2712-7.
- [34] [FAO/WHO] Food and Agriculture Organization of the United Nations/World Health Organization and FAO/WHO, 2008. Viruses in food: Scientific advice to support risk management activities. In Meeting report. Microbiological Risk Assessment Series No. 13. Rome and Geneva.
- [35] Food and Agriculture Organization of the United Nations (FAO), Coronavirus disease (COVID-19) outbreak. Available on: <http://www.fao.org/2019-ncov/en/>. Feb 2020.
- [36] EFSA .2020. Coronavirus: no evidence that food is a source or transmission route. Available online: <https://www.efsa.europa.eu/en/news/coronavirus-no-evidence-food-source-or-transmission-route>
- [37] Maggini S, Pierre A, Calder PC. Immune function and micronutrient requirements change over the life course. *Nutrients*. 2018 Oct;10(10):1531.
- [38] Collins, C .2020. 5 ways nutrition could help your immune system fight off the coronavirus. Available online: <https://theconversation.com/5-ways-nutrition-could-help-your-immune-system-fight-off-the-coronavirus-133356>
- [39] Savino W, Dardenne M. Nutritional imbalances and infections affect the thymus: consequences on T-cell-mediated immune responses. *Proceedings of the Nutrition Society*. 2010 Nov;69(4):636-43.
- [40] Hemilä H. Vitamin C and infections. *Nutrients*. 2017 Apr;9(4):339.
- [41] Prentice S. They are what you eat: can nutritional factors during gestation and early infancy modulate the neonatal immune response?. *Frontiers in immunology*. 2017 Nov 28;8:1641.
- [42] Micronutrient Information Center. Immunity in Depth. Available online: <http://lpi.oregonstate.edu/mic/health-disease/immunity> (accessed on 17 April 2018).
- [43] Hemilä H, Chalker E. Vitamin C for preventing and treating the common cold. *Cochrane database of systematic reviews*. 2013(1).
- [44] Calder, P.; Prescott, S.; Caplan, M. Scientific Review: The Role of Nutrients in Immune Function of Infants and Young Children; Emerging Evidence for Long-Chain Polyunsaturated Fatty Acids; Mead Johnson & Company: Glenview, IL, USA, 2007.
- [45] Maggini S, Maldonado P, Cardim P, Fernandez Newball C, Sota Latino E. Vitamins C, D and zinc: synergistic roles in immune function and infections. *Vitam Miner*. 2017;6(167):2376-1318.
- [46] Aranow C. Vitamin D and the immune system. *Journal of investigative medicine*. 2011 Aug 1;59(6):881-6.
- [47] Mangin M, Sinha R, Fincher K. Inflammation and vitamin D: the infection connection. *Inflammation Research*. 2014 Oct 1;63(10):803-19.

- [48] Institute of Medicine. Dietary Reference Intakes for Calcium and Vitamin D; The National Academies Press: Washington, DC, USA, 2011.
- [49] Albers R, Bourdet-Sicard R, Braun D, Calder PC, Herz U, Lambert C, Lenoir-Wijnkoop I, Meheust A, Ouwehand A, Phothirath P, Sako T. Monitoring immune modulation by nutrition in the general population: identifying and substantiating effects on human health. *British Journal of Nutrition*. 2013 Aug;110(S2):S1-30.
- [50] Johnston CS, Barkyoumb GM, Schumacher SS. Vitamin C supplementation slightly improves physical activity levels and reduces cold incidence in men with marginal vitamin C status: A randomized controlled trial. *Nutrients*. 2014 Jul;6(7):2572-83.
- [51] Maggini S, Beveridge S, Suter M. A combination of high-dose vitamin C plus zinc for the common cold. *Journal of International Medical Research*. 2012 Feb;40(1):28-42.
- [52] Graf P, Eccles R, Chen S. Efficacy and safety of intranasal xylometazoline and ipratropium in patients with common cold. *Expert opinion on pharmacotherapy*. 2009 Apr 1;10(5):889-908.
- [53] Yamshchikov A, Desai N, Blumberg H, Ziegler T, Tangpricha V. Vitamin D for treatment and prevention of infectious diseases: a systematic review of randomized controlled trials. *Endocrine Practice*. 2009 Jul 1;15(5):438-49.
- [54] Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, Dubnov-Raz G, Esposito S, Ganmaa D, Ginde AA, Goodall EC. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. *bmj*. 2017 Feb 15;356.
- [55] Haryanto B, Suksmasari T, Wintergerst E, Maggini S. Multivitamin supplementation supports immune function and ameliorates conditions triggered by reduced air quality. *Vitam. Miner*. 2015;4:1-5.
- [56] Chandra RK. Nutrition and the immune system from birth to old age. *European journal of clinical nutrition*. 2002 Aug;56(3):S73-6.
- [57] Hamer DH, Sempértegui F, Estrella B, Tucker KL, Rodríguez A, Egas J, Dallal GE, Selhub J, Griffiths JK, Meydani SN. Micronutrient deficiencies are associated with impaired immune response and higher burden of respiratory infections in elderly Ecuadorians. *The Journal of nutrition*. 2009 Jan 1;139(1):113-9.
- [58] Penn ND, Purkins L, Kelleher J, Heatley RV, Mascie-Taylor BH, Belfield PW. The effect of dietary supplementation with vitamins A, C and E on cell-mediated immune function in elderly long-stay patients: a randomized controlled trial. *Age and Ageing*. 1991 May 1;20(3):169-74.
- [59] Chandra RK. Effect of vitamin and trace-element supplementation on immune responses and infection in elderly subjects. *LANCET-LONDON*. 1992 Nov 7;340:1124-.
- [60] Schmoranz F, Fuchs N, Markolin G, Carlin E, Sakr L, Sommeregger U. Influence of a complex micronutrient supplement on the immune status of elderly individuals. *International journal for vitamin and nutrition research*. 2009 Sep 1;79(56):308-18.
- [61] Prasad AS. Zinc: mechanisms of host defense. *The Journal of nutrition*. 2007 May 1;137(5):1345-9.
- [62] Mocchegiani E, Romeo J, Malavolta M, Costarelli L, Giacconi R, Diaz LE, Marcos A. Zinc: dietary intake and impact of supplementation on immune function in elderly. *Age*. 2013 Jun 1;35(3):839-60.
- [63] Elmadfa, I.; Meyer, A.; Nowak, V.; Hasenegger, V.; Putz, P.; Verstraeten, R.; Remaut-DeWinter, A.M.; Kolsteren, P.; Dostálová, J.; Dlouhý, P.; et al. *European Nutrition and Health Report*. Forum Nutr. 2009, 62, 1–405.
- [64] Prentice S. They are what you eat: can nutritional factors during gestation and early infancy modulate the neonatal immune response?. *Frontiers in immunology*. 2017 Nov 28;8:1641.
- [65] De la Fuente M, Hernanz A, Guayerbas N, Manuel Victor V, Arnalich F. Vitamin E ingestion improves several immune functions in elderly men and women. *Free radical research*. 2008 Jan 1;42(3):272-80.
- [66] Meydani SN, Meydani M, Blumberg JB, Leka LS, Siber G, Loszewski R, Thompson C, Pedrosa MC, Diamond RD, Stollar BD. Vitamin E supplementation and in vivo immune response in healthy elderly subjects: a randomized controlled trial. *Jama*. 1997 May 7;277(17):1380-6.
- [67] Meydani SN, Leka LS, Fine BC, Dallal GE, Keusch GT, Singh MF, Hamer DH. Vitamin E and respiratory tract infections in elderly nursing home residents: a randomized controlled trial. *Jama*. 2004 Aug 18;292(7):828-36.