

# Orthomolecular Therapy for Management & Prevention of SARS-CoV-2 Disease

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**Abstract:-** The renowned coronavirus spread throughout the entire world within a short duration of time and in the process it destroyed everything it encountered in its path, like an invisible fire. This article is to review some of the key features of the coronavirus pandemic and also the virus that causes it. That is, to review the covid-19 virus, which is also known as SARS-CoV-2 (Severe Acute Respiratory Syndrome – Corona Virus – 2). Several vaccines have been developed worldwide for the prevention and treatment of this virus, but due to the limitation of their distribution and manufacturing capacities, the targeted global “herd immunity” has not been achieved. Meanwhile, SARS-CoV-2 is constantly mutating and that unfortunately limits the effectiveness of various vaccination campaigns, notwithstanding the speed of the campaigns. Meanwhile, the current antiviral drugs being used including ivermectin, hydroxychloroquine, ritonavir and lopinavir have not resulted into any conclusive benefits to those infected. Therefore, more effective treatments that are affordable, safe and available globally are urgently needed for targeting the SARS-CoV-2 infections. Covid-19 infections affects the upper respiratory tract and also the lower respiratory tract. However, about 80% of the patients with the disease will not require any hospitalization because their symptoms are relatively mild. But, for the remaining 20% patients, the disease deteriorates to the lower respiratory tract and results into pneumonia. Unfortunately, about 6% of the covid-19 patients with pneumonia (out of the 20% patients with lower respiratory tract involvement) eventually develop respiratory failure which usually require urgent admission to an Intensive Care Unit (ICU) for adequate support. The most frequent and commonly reported symptoms of covid-19 infections are cough, shortness of breath, and fever. The clinical diagnosis for covid-19 infections can be made using the symptoms, chest imaging, and exposures history. In addition to that, an individual that is suspected to have covid-19 can be evaluated and thereafter confirmed for SARS-CoV-2 based on quantitative Real Time – Polymerase Chain Reaction (qRT-PCR), which is a viral nucleic acid test. So far, covid-19 has proven to be a serious global health threat and it has strained the global healthcare capacity. Therefore, it is very important and necessary to really study it and develop more effective pharmacological treatments which are effective for the treatment and prevention of the disease. In this article, we will review an anti-viral therapy made up of quercetin, zinc and ascorbic acid (vitamin C) combination. This combination

has proven to be quite effective and safe. Also, various clinical studies and anecdotal evidence supports its efficacy in the management and prevention of covid-19 infections. The evidence includes a study done at Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, Pakistan and another study at the Department of Critical Care Medicine, Zhongnan Hospital of Wuhan University, China.

**Keywords:-** Covid-19, SARS-CoV-2, Quercetin, Zinc, Ascorbic Acid.

## I. INTRODUCTION

The renowned coronavirus spread throughout the world within a short duration of time and in the process it destroyed everything it encountered in its path, like an invisible fire. The virus did not differentiate between a Western country or an Arab country, it also did not differentiate between a Black person or a White person, an Asian or an European. The whole of humanity globally was indeed terrified by a virus which has a genome size that is lesser than 35 kilobases.<sup>1</sup>

This article is to review some of the key features of the coronavirus pandemic and the virus that causes it. That is, the covid-19 virus, which is also known as SARS-CoV-2 (Severe Acute Respiratory Syndrome – Corona Virus – 2). This article will also review a proven and effective therapy that can help to prevent and survive this deadly virus.

According to the World Health Organization (WHO) report, in the week of 27th December 2021 to the 2nd of January 2022, globally the total number of new cases of covid-19 increased significantly by about 70% when compared to the previous weeks. But the figure for new deaths decreased by only about 10%.<sup>2</sup> That corresponds to over 9 million fresh cases and about 40,000 new deaths recorded during the week indicated above. As of 2nd January 2022, a total of about 290 million fresh cases and about 5 million deaths were reported worldwide from covid-19.<sup>2</sup>

During that same period, all the regions of the world reported an increment in their weekly case incidence, with the continent of the Americas reporting the biggest increase of 100%, followed by the South-East Asia Region with 78%, and the European Region recording over 60% increment. In addition, the African Region recorded weekly increment in the total number of new deaths by over 20%. All the other regions combined recorded a reduction, when compared to the previous week.<sup>2</sup>

The implication of the above statistics and data is that since year 2019 when the corona virus pandemics started, it was still widespread and very active up till year 2022, a period of about 3 years. Unfortunately, during that same period many lives were lost. Infact, many families worldwide lost at least one or two family members to this disease, notwithstanding all the various vaccination programmes and conventional medical treatments being used globally. Right now, the virus has continued to mutate from one deadly variant to another, non-stop.<sup>2</sup>

Infact, on the 11th of January 2022, Reuters News outlet reported that the United States had 1.35 million new cases of covid-19 infections, based on the Monday January 10th 2022 data. According to Reuters, it was the highest daily total by any country globally. The previous record for the US on January 3<sup>rd</sup> 2022 was 1.03 million cases. Meanwhile, large number of new cases were reported each Monday and the reason was because many of the states did not make report over the weekend. So, the seven-day average for fresh cases of covid-19 infections skyrocketed to over 700,000 new infections a day, in the last 2 weeks.<sup>3</sup> Meanwhile, the spread of the very deadly and highly contagious and new omicron variant was showing no signs of slowing down as at the time of this research.

So far, many vaccines have been developed worldwide, but due to the limitation in their distribution and the manufacturing capacities, the targeted global “herd immunity” was not achieved.<sup>4</sup> Another issue was the rapid mutations of SARS-CoV-2 which limited the effectiveness of various vaccination campaigns, notwithstanding the speed of the campaigns. Meanwhile, the current antiviral medications being used including ivermectin, hydroxychloroquine, and ritonavir did not show any significant benefits to those infected.<sup>4</sup> Therefore, more effective treatments which are affordable, safe, and available globally for targeting covid-19 are urgently required.

Recently, there have been many pandemics and some of them have greatly increased the risk to humankind globally. The covid-19 pandemic was the most recent of these. The desire to develop effective vaccines that can be effective against SARS-CoV-2 has not yielded many results due to the constant mutation of the virus. In addition, there are challenges relating to the capacity to quickly and efficiently manufacture, and distribute the vaccines globally.<sup>4</sup>

## II. DISCUSSION

### A. Epidemiology of SARS-CoV-2

Coronaviruses are major pathogens to animals and humans. Meanwhile, the coronavirus of year 2019 has been identified as the cause of most of the pneumonia cases in Wuhan, which is a city in the Hubei Province of the People Republic of China. The virus quickly spread as an epidemic across China, which was then followed by a global pandemic.<sup>5</sup>

In February 2020, the WHO classified the disease as covid-19. But the virus that caused covid-19 is specifically known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Before, it was referred to as 2019-nCoV.<sup>5</sup> Since the first case was recorded in Wuhan at the end of year 2019, more cases have also been recorded in all the various continents of the globe. Worldwide, almost 300 million confirmed cases of covid-19 infections have been recorded and the actual updated case counts can be found on the websites of the WHO.<sup>5</sup> But, the reported case counts did not represent accurately the major impacts of covid-19 infections considering that only some of the acute infections were diagnosed and eventually reported globally. Infact, seroprevalence surveys throughout the United States and Europe implied that after accounting for potential false positives, and negatives, the rate of previous exposure to covid-19 that was indicated by seropositivity exceeds the actual incidence of the reported cases by over 10-folds.<sup>5</sup>

A direct person-to-person respiratory infection is the major route of transmission of covid-19 and it usually occur through a close-range contact of about six feet, or two meters, via respiratory particles. The respiratory particles are actually virus released as respiratory secretions, mostly when a person with covid-19 infection talks, sneezes or coughs. The secretions can infect other people when inhaled or if it gets into direct contact with other people’s mucous membranes.<sup>5</sup> Covid-19 infection can also occur when a person’s hands are contaminated by the respiratory secretions of infected people. Or if a person touches contaminated surfaces and then uses the same hand to touch his or her eyes, nose, or mouth. Covid-19 infections can also be transmitted over longer distances by means of airborne routes. That is, when a person inhales infected particles that were dispersed through the air over a long distance or time.<sup>5</sup>

### B. Pathophysiology of SARS-CoV-2

The coronavirus infection usually involves the upper respiratory tract and also the lower respiratory tract. Meanwhile, about 80% of the patients with infection do not need any hospitalization. And the reason for that is because the symptoms are usually relatively mild, and the immune systems usually limits the virus effectively within the patient’s upper respiratory tract.<sup>6</sup> But, in the remaining 20% patients the covid-19 infection progressed into the lower respiratory tract which then eventually resulted into pneumonia. Unfortunately, about 6% of the covid-19 patients with pneumonia, that is 6% of the 20% patients with lower respiratory tract involvement, eventually develop respiratory failure which then led to an Intensive Care Unit (ICU) admission for support. Also, studies have shown the respiratory failure to be mostly due to Acute Respiratory Disease Syndrome (ARDS), and the time from the disease onset to death usually range from about 15 to 52 days in the fatal cases.<sup>6</sup>

Meanwhile, ARDS is a major complication of infectious pneumonias and that includes the infections resulting from pathogenic coronaviruses like SARS-CoV-2 (COVID-19), MERS-CoV (MERS), and SARS-CoV (SARS). The autopsy findings of patients who died of covid-19 infections usually

include bronchogenic pneumonia, diffuse alveolar damage, microvascular thrombosis, and alveolar haemorrhage with capillary damage. Those autopsy findings were also seen in ARDS due to other aetiologies apart from covid-19.<sup>6</sup> So far, aggressive host inflammatory response was thought to be the cause of ARDS and the associated multi-organ failure, but the actual molecular features and immunological mechanisms observed in severe cases of covid-19 infections were not fully understood. However, cell-based studies have revealed that lung injuries observed in SARS-CoV were usually triggered initially by the viral spike protein, that then resulted in a more aggravated production of inflammatory cytokines by the recruited macrophages, hence a severe lung injury.<sup>6</sup>

So, the pathologic changes of the pulmonary vasculature and the lung alveoli will eventually result into a compromised gas exchange. Studies have revealed the lungs of covid-19 patients to be characterized with arteritis, endothelial dysfunction, micro and macrovascular thromboses, and aberrant vasodilation. Unfortunately, all those features collectively and individually complicate the already existing ventilation-perfusion mismatch. Also, the lung tissues in fatal cases of SARS-CoV infections and those of SARS-CoV-2 infections have similar molecular, pathological, and immunological features.<sup>6</sup>

However, there was an hypothesis that the lung physiology in covid-19 infections is different from those recorded in other forms of ARDS and the reason was because the lung compliance of patients with covid-19 infections may be preserved depending on the extent of hypoxaemia, which was not the case in other ARDS aetiologies. A likely reason for that observation is that the pathophysiology in covid-19 infections usually involved the pulmonary vascular endothelium, instead of the alveolar epithelium.<sup>6</sup> Also, some cardiovascular co-morbidities which are characterized by endothelial dysfunction such as obesity, diabetes and hypertension, are also risk factors for high mortality rate in covid-19. Meanwhile, various autopsy findings have shown the presence of SARS-CoV-2 antigens in the extrapulmonary organs of infected patients, such as the; spleen, liver, neurons, kidneys, and the gastrointestinal tract.<sup>6</sup>

### C. Clinical Features of SARS-CoV-2

As already stated above, over 80% of covid-19 cases are without any symptoms or with only mild symptoms. However, when symptoms are present it usually includes cough, shortness of breath, fever, and general breathing difficulties.<sup>7</sup>

In the other patients, that is the 20% with full or severe symptoms, covid-19 usually results into very severe illness with significant complications such as sepsis, acute respiratory failure, severe pneumonia, septic shock, pulmonary oedema, acute respiratory distress syndrome (ARDS), multiple organ failure, and even death.<sup>7</sup>

Meanwhile, in the cases with symptoms it usually appears between 2 to 14 days after exposure to the viral infection. And it usually takes 5 days on average, from the onset of the symptoms to the stage of radiological

confirmation of pneumonia. While it takes about 10 days duration from the onset of symptoms to ICU admission, on average. The most frequent and commonly presented symptoms of covid-19 are;

- Fever (in over 95% of patients),
- Cough (in about 80% of patients), and
- Shortness of breath (in over 60% of patients).<sup>7</sup>

In addition to the above, some less reported symptoms are headache, discomfort, chest pain, runny nose, nasal congestion, diarrhoea, and sore throat. But not all the less reported symptoms are present in covid-19 cases.<sup>7</sup>

### D. Clinical Diagnosis of SARS-CoV-2

The clinical diagnosis of covid-19 infections can be made using exposure history, chest imaging, and symptoms. Although covid-19 manifest with various symptoms, it is not all of the symptoms that are found in every patient. Therefore, there are no specific symptoms or signs that could indicate covid-19, especially when compared to the signs and symptoms of respiratory illnesses recorded in other similar viral infections like common cold and influenza.<sup>7</sup>

So, a very rigorous and thorough clinical examination is required before making the final diagnosis for covid-19 infections. In addition, patients with covid-19 symptoms have to be evaluated and confirmed for SARS-CoV-2 based on quantitative Real Time – Polymerase Chain Reaction (qRT-PCR) test, which is a viral nucleic acid test. The qRT-PCR test uses the respiratory tract samples taken from the patients such as nose swabs, throat swabs, etc.<sup>7</sup>

In pregnant women, samples taken from the cord blood, neonatal throat swab, and amniotic fluid can be used for the diagnosis of SARS-CoV-2 using the qRT-PCR test. Also, chest CT imaging have a very high diagnostic value because of its time efficiency, unique images of virus infection, and a low false-negative rate with high accuracy.<sup>7</sup>

The qRT-PCR test is the accepted gold standard for the clinical diagnosis of covid-19 pneumonia, but the following laboratory investigations are also beneficial; inflammatory markers, and complete blood counts (CBC). Also, a detailed evaluation of the patient's medical history, and epidemiological exposure are very important.

## III. QUERCETIN, ZINC & ASCORBIC ACID AS ANTI-VIRAL THERAPY FOR SARS-COV-2

So far, the covid-19 pandemic has proven to be a very serious global health threat and it strained the global healthcare capacity. Therefore there is a need for more effective pharmacological drugs and alternative medical treatments that may be very suitable for the treatment of covid-19, and also prevention of the disease. In this article, we will review an anti-viral therapy made up of quercetin, zinc and ascorbic acid (vitamin C). The therapy has been proven to be safe and very effective. Also the therapy is easily affordable and available, with a sound biological rationale in the treatment of patients with the covid-19 disease, and as a

prophylaxis in high-risk populations. In addition, it can also be used as an adjunct to some of the currently promising pharmacological drugs, like remdesivir and convalescent plasma.<sup>8</sup>

Quercetin is an effective flavonoid with confirmed antiviral properties that have been investigated and proven in various clinical studies. While ascorbic acid is a crucial vitamin needed for the correct functioning of our immune system. In addition to that, ascorbic acid plays a critical function in stress response, and it has also proven to be very effective when administered to the critically ill. Meanwhile, there is evidence that ascorbic acid and quercetin co-administration gives a synergistic antiviral effect resulting from their overlapping immunomodulatory and antiviral properties. Ascorbic acid also has the capacity to recycle quercetin within the body, thereby increasing its efficacy.<sup>9</sup>

Zinc is a trace element which is needed to preserve the natural tissue barriers, like those in the respiratory epithelium, and thereby prevent pathogen entry. Zinc also functions by ensuring a balanced function of the redox system and the immune system. So, zinc deficiency has been found to be a predisposing factor to covid-19 infection and the detrimental progression of the disease.<sup>9</sup> Therefore, zinc administration will be beneficial to most people in the population, including those with sub-optimal zinc status.<sup>9</sup>

Due to the rapid spread of the corona pandemic and considering the large number of people affected globally, cost-effective, safe, and globally available therapeutic options to combat these viral infections are urgently required. In addition, the therapy should have little or no side effects, with simple application. Based on the above criteria, this article presents the potential of quercetin, zinc and ascorbic acid combination for the prevention and treatment of covid-19 infections. The combination indeed meet all the criteria previously listed above for a safe therapeutic option.

#### A. Quercetin

Several studies have been carried out on quercetin for its antiviral efficacy on corona viruses. The research team of Ling Yi found that quercetin offers a major potential as an antiviral drug and for the effective treatment of SARS.<sup>8</sup> Cell entry is an important step in viral infections, so it has been closely studied as a mechanism for potential target of antiviral treatments. Meanwhile, in an experiment with the H3N2 influenza and H1N1 influenza infection of the MDCK cells, quercetin treatment reduced the deadly effect of the virus by binding the Hemagglutinin Proteins (HA). Specifically, quercetin was found to bind the HA subunit which was responsible for the deadly phase of membrane fusion during viral entry and also during virus-mediated hemolysis.<sup>8</sup>

In addition, the antiviral effects of quercetin on other viruses like the adenoviruses (ADV-3,-8,-11) and herpesviruses (HSV-1, 2) indicated the effective inhibition of the early stage viral replication of the viruses in a dose dependent manner. It also indicated the inhibition of the viral RNA and DNA polymerase. Meanwhile, vitamin C has been shown to prevent the spontaneous degradation of quercetin,

thereby necessitating the co-administration of quercetin with vitamin C.<sup>8</sup> Also, the beneficial effects of quercetin against other viruses, like; HIV, poliovirus, and coxsackie have been documented in various experiments. Overall, quercetin has the ability to bind the essential proteins which are required for RNA transcription from minus-strand into positive polarity RNAs. This also includes its ability to inhibit some key enzymes such as Integrase (IN), Reverse Transcriptase (RT), and Protease (PR), thereby reducing the levels of viral infectivity.<sup>8</sup>

SARS-CoV-2 as a betacoronavirus has been confirmed to cause severe inflammatory pneumonia, therefore any excessive inflammation becomes a major risk factor for the progression of the disease and according to various records, cytokine storm has been found to be strongly responsible for death in such patients. The reason is because cytokine storm and severe inflammation lead to acute lung injury, acute respiratory distress syndrome, and multiple organ dysfunction syndromes. Since quercetin is an antioxidant, anti-inflammatory compound, and an analgesic compound, so it is an excellent treatment for the severe inflammation resulting from covid-19 infection.<sup>4</sup> In addition, quercetin has a major inhibitory effect on general inflammatory responses, and it inhibits the production of NLRP3 inflammasome. It also suppresses inflammation by interfering with various inflammation signaling pathways.<sup>10</sup>

#### B. Zinc

Zinc is a known essential trace element that is required for the maintenance, growth, and development of the immune functions. Infact, zinc impact reaches all the organs and cells, thereby representing a major component of the human proteome which encompasses many important transcription factors and enzymes.<sup>11</sup> However, zinc deficiency is very common and it affects about 25% of the general population of most developing countries. Zinc deficiency also affects many developed countries. Meanwhile, studies have shown that zinc status is actually a very critical factor which can determine antiviral immunity and zinc-deficient populations have been found to be at risk of acquiring viral infections like hepatitis C virus and HIV. Various scientific studies in the last 50 years have confirmed the anti-viral ability of zinc against many viruses through different mechanisms of action.<sup>11</sup>

Therefore, increasing the intracellular concentration of zinc in the body can efficiently reduce the replication of many RNA viruses, including influenza virus and polio virus, by interfering with viral polyprotein processing. That is, zinc inhibits the RNA synthesizing ability of viruses. Enzymatic studies have showed that zinc directly inhibit the activity of polymerases. Specifically, zinc has been found to block the initiation of RNA synthesis, and in the case of the SARS-CoV infection the template binding was reduced while the elongation was inhibited.<sup>12</sup> So, based on all of the above findings, it is obvious why zinc deficiency usually lead to a compromised biological functions and also a compromised immune system, which can then eventually leads into increased vulnerability to infectious diseases like covid-19.<sup>13</sup>



### C. Ascorbic Acid

Various clinical studies have shown that covid-19 infection increases oxidative stress within the body, thereby leading to tissue and cellular damage. To combat this, the administration of ascorbic acid in combination with the other conventional standard treatments has proven to be a safe and effective treatment for very severe cases of respiratory viral infections.<sup>14</sup> The mortality, morbidity, spread, and infectiveness of infectious diseases are majorly based on the host–pathogen relationship. Therefore, due to the unavailability of a safe and effective antiviral drugs for corona viruses, more attention should be given to support the host immune defense. Also, the introduction of high-dose vitamin C therapy could drastically reduce the need for the currently used antiviral, corticosteroids, and antibacterials for covid-19 disease. Some of which have been found to be toxic and immunosuppressive.<sup>14</sup>

To effectively and efficiently fight covid-19 infection, there is a need to fully utilize readily available nutritional therapies and pharmaceutical agents like vitamin C which has proven antioxidant, anti-inflammatory and immunosupportive properties. Supplemental vitamin C has been shown to be beneficial for the prevention of viral infections, by lessening the complication of the disease and by shortening the course of the disease.<sup>14</sup> Studies have shown that virus caused infections are usually associated with many redox modifications, which is a characteristic of acute oxidative stress. So, changes in redox homeostasis within the infected cells are part of the major mechanisms in the pathogenesis of many respiratory viral infections like covid-19, which then contributes to severe inflammatory reaction and the subsequent tissue damage. Studies have also shown that the redox change of an oxidized state is important in the activation of various pathways which are eventually taken over by viruses for their self-replication and the suppression of the patient's immune system.<sup>14</sup>

Increased oxidative stress usually lead to a systemic inflammatory response because of an increase in the production of cytokines. This eventually contributes to ARDS, which is the main pathology in the high mortality rate of most of the acute respiratory viral infections like covid-19. Unfortunately, although cytokines have antiviral roles in respiratory infections but their excessive productions in cytokine storms are quite damaging to lung tissue than the viruses themselves.<sup>9</sup> Meanwhile, various research have confirmed that vitamin C plays an essential role in the production of Type I interferons in antiviral immune responses. Vitamin C has also been shown to increase the activity of cytotoxic T-Lymphocytes and Natural Killer (NK) cells. This then acts as key inactivating agent for DNA viruses and RNA viruses in a way that lessens their viral infectivity.<sup>14</sup>

In addition to all the above, vitamin C has been shown to eliminate viral products which usually cause inflammation and pain. Also, studies have confirmed the effectiveness and efficacy of vitamin C in the treatment of other viral infections and pneumonia, based on its direct inhibitory effects on viruses. Vitamin C has been found to be a local mucosal protecting agent in the epithelial lining of the respiratory tract

which then helps to reduce symptoms of upper respiratory tract infections.<sup>14</sup> So, a high dose of vitamin C can therefore be used as proven therapeutic agent which reduces inflammation and oxidative stress during coronavirus infection. Vitamin C also improves antiviral immune defenses and suppresses viral replications. Moreso, clinical trials on vitamin C therapy have recorded positive results for its use in treating other respiratory infections. In those trials, critically ill patient population who supplemented with vitamin C had a significant reduction in their death rate.<sup>14</sup>

## IV. CONCLUSION AND SUGGESTION

In conclusion, various clinical and anecdotal evidence support the efficacy of quercetin, zinc and ascorbic acid combination for the management and prevention of covid-19 infections.

Firstly, between September 2020 and March 2021, a total of 152 outpatients who had confirmed cases of covid-19 infections were enrolled for a clinical study at the Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, Pakistan. The patients were both male and female above the age of 18 years who have tested positive for covid-19, as confirmed by qRT-PCR tests. The patients also had the typical symptoms that are usually associated with covid-19 infections such as dry cough, fever, sore throat, shortness of breath, conjunctivitis, rhinorrhea, and cold.<sup>10</sup> From the results recorded in the 30-day, prospective, open-label, randomized, controlled, clinical trial, quercetin as an adjuvant therapy improved all the clinical outcomes considered for the study. The outcomes included the need for hospitalization, the duration of hospitalization, the need for a non-invasive oxygen therapy, progression to ICU, and the number of deaths.<sup>10</sup>

Also, quercetin was well tolerated by all the subjects who participated in the study, without any major side effect, or adverse drugs reactions. And the clinical results from the trial were in line with a recent meta-analysis of pre-clinical trials in which it was concluded that pre-clinical use of quercetin significantly reduced the viral load, mortality rate, production of mucus, release of pro-inflammatory cytokines, resistance of the airways, and presence of reactive oxygen species.<sup>10</sup>

Secondly, as part of the rush to discover effective treatment for covid-19, some Chinese teams added vitamin C to their list of potential treatments. Amongst them ZhiYong Peng (MD) of the Zhongnan Hospital of Wuhan University Department of Critical Care Medicine recently registered a phase 2 clinical trial on “ClinicalTrials.gov” which was to test the efficacy of vitamin C infusions as treatment for SARS that is associated with covid-19 infections.<sup>15</sup> The study description stated vitamin C as an antioxidant which may help to prevent cytokine-induced damage to the lungs. The description also stated that vitamin C reduces the inflammatory response, shortens the duration, and prevents common cold. Also, it was noted that insufficient vitamin C was connected to the severity and risk of influenza infections.

In a series of YouTube videos that was released by Richard Cheng (MD, PhD), who was also the Editor of the Chinese Edition of Orthomolecular Medicine News Service, it was on record that three clinical studies were going on in China to determine the effects of high-dose IV vitamin C in the treatment of covid-19 infections. He also mentioned that the Shanghai Medical Association released an expert consensus statement on the result of comprehensive treatment of covid-19 with high-dose IV vitamin C.<sup>15</sup> Also according to Dr. Richard Cheng, the Principal Investigator for the first high-dose IV vitamin C clinical study in China told him that the preliminary results of their study were quite impressive and also that the administration of high dose Vitamin C to covid-19 patients actually led to significant reductions in inflammation. That finding alone was indeed notable considering that massive inflammation in the lungs is usually fatal in covid-19 infections.

Lastly, the author of this research has prescribed the same therapy made up of quercetin, zinc and ascorbic acid combination to his clients, family members, and friends, for the management and prevention of covid-19 infections. The results were impressive with high survival rate, even for covid-19 infected persons who were at the point of death.

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#### REFERENCES

- [1]. Coronavirus Disease 2019 (COVID-19): A Simplified Assessment of its Origin, Epidemiology and Physiological Manifestations. <https://scialert.net/fulltext/?doi=ajsr.2021.13.23> [accessed 11 January 2022].
- [2]. Weekly epidemiological update on COVID-19 - 6 January 2022. Edition 73, 6 January 2022. Emergency Situational Updates <https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---6-january-2022> [accessed 11 January 2022]
- [3]. U.S. reports 1.35 million COVID-19 cases in a day, shattering global record. By Lisa Shumaker, January 11, 2022 7:21 AM WAT <https://www.reuters.com/business/healthcare-pharmaceuticals/us-reports-least-11-mln-covid-cases-day-shattering-global-record-2022-01-11/> [accessed 11 January 2022]
- [4]. F. D. Pierro, G. Derosa, et al. Possible Therapeutic Effects of Adjuvant Quercetin Supplementation Against Early-Stage COVID-19 Infection: A Prospective, Randomized, Controlled, and Open-Label Study. *International Journal of General Medicine. Clinical Trial Report* Published 8 June 2021 Volume 2021:14 Pages 2359—2366. DOI <https://doi.org/10.2147/IJGM.S318720>
- [5]. K. McIntosh MD, M. S. Hirsch MD, et al. COVID-19: Epidemiology, virology, and prevention. <https://www.uptodate.com/contents/covid-19-epidemiology-virology-and-prevention> [accessed 11 January 2022].
- [6]. R. Kumar, M. H. Lee, et al. Pathophysiology and potential future therapeutic targets using preclinical models of COVID-19. <https://openres.ersjournals.com/content/6/4/00405-2020> [accessed 11 January 2022]
- [7]. E. C. Abebe, T. A. Dejenie, et al. The newly emerged COVID-19 disease: a systemic review. *Virology Journal* volume <https://link.springer.com/article/10.1186/s12985-020-01363-5#citeas> [accessed 11 January 2022]
- [8]. R. M. Luciano, E. Marik, et al. Quercetin and Vitamin C: An Experimental, Synergistic Therapy for the Prevention and Treatment of SARS-CoV-2 Related Disease (COVID-19). *Front Immunol.* 2020 Jun 19;11:1451. doi: 10.3389/fimmu.2020.01451. eCollection 2020
- [9]. I. Wessels, B. Rolles, et al. The Potential Impact of Zinc Supplementation on COVID-19 Pathogenesis. *Front. Immunol.*, 10 July 2020 | <https://doi.org/10.3389/fimmu.2020.01712>
- [10]. A. R. Scott, S. Obeid, et al. The Role of Zinc in Antiviral Immunity. *Adv Nutr.* 2019 Jul; 10(4): 696–710. Published online 2019 Apr 22. doi: 10.1093/advances/nmz013
- [11]. J. W. Aartjan, H. E. Sjoerd, et al. Zn<sup>2+</sup> Inhibits Coronavirus and Arterivirus RNA Polymerase Activity In Vitro and Zinc Ionophores Block the Replication of These Viruses in Cell Culture <https://doi.org/10.1371/journal.ppat.1001176>
- [12]. Antiviral and immunological activity of zinc and possible role in COVID-19 <https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/antiviral-and-immunological-activity-of-zinc-and-possible-role-in-covid19/21DD0E9EDABC96DC94715DB30BAB11DE> [accessed 11 January 2022]
- [13]. B. X. Hoang, G. Shaw, W. Fang, B. Hana. Possible application of high-dose vitamin C in the prevention and therapy of coronavirus infection. *Elsevier Journal of Global Antimicrobial Resistance.* Volume 23, December 2020, Pages 256-262
- [14]. R. J. Jariwalla, S. Harakeh. Antiviral and Immunomodulatory Activities of Ascorbic Acid. *Subcellular Biochemistry* pp 215-23
- [15]. Can Vitamin C Prevent and Treat Coronavirus? By Karina Lichtenstein on 03/09/2020 2:00 PM <https://www.medicinenet.com/script/main/art.asp?articlekey=228745> [accessed 11 January 2022]