

# The Study Role of Contribution of Vitamin D, Cholecalciferol, To the Immunological Response Following a COVID-19 Infection

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**Abstract:** There is a worldwide health crisis as a result of the COVID-19 epidemic. Regarding this virus's defensive properties, not much is known. Therefore, there is an urgent need for preventative treatments that might lessen the severity, duration, and risk of infection. The review examined vitamin D's possible symptoms are in respiratory infections, such as Covid-19. In addition, credit score As of May 20, 2020, this research has shown a relationship between vitamin D levels and Covid-19 cases and deaths in 20 European countries. There is a significantly poor association ( $p = 0.033$ ) between mean and vitamin D levels and COVID-19 cases per million people in developing countries. This did not happen with Covid-19 deaths in these countries, although there was a strong relationship. Research has indicated a relationship between the Corona virus and deaths and vitamin D levels; however, when confounding variables were taken into account, no association was identified in other research.

## (Introduction)

### Vitamin D

Bone health depends on vitamin D. The body must absorb and control the flow of calcium and phosphorus into and out of the skeleton in order to maintain strong bones. Vitamin D deficiency can cause abnormalities in the bones, including rickets. Although it is regarded as an essential food, vitamin D is actually a hormone that the body can produce. The body may generate vitamin D through skin contact to sunshine, which makes its specific demand levels more complex than those of other essential nutrients [1]. When exposed to UV radiation, the skin produces steroid hormones like vitamin D. Alternatively, supplemental foods or outside food sources can supply them.

Vitamin D insufficiency is an problem that impacts more than a billion people worldwide in all spheres of life. During the past ten years, several investigations have proposed a potential connection between low vitamin D and other disorders, such as systemic infection. The immune system is impacted by low vitamin D levels because antiviral peptides, which boost mucosal defenses, are produced more frequently and increase innate immunity through immunomodulatory pathways. 1, 2] Low serum vitamin D levels have been associated in clinical investigations with acute respiratory tract infections, especially epidemic influenza. Information from eight observational studies was used in a recent meta-analysis to determine the blood vitamin D content of participants[2].

Evidence of the Beneficial Effects of Vitamin D on a Range of Viral Parasites Immune system regulation is one of vitamin D's main roles. A previous investigation discovered a link between vitamin D levels and the immune system's capacity to fight off viral infections. TLRs provide a well-known role in mediating the innate response by controlling the activity of immune cells such as monocytes, macrophages, and epithelial cells. Thus, the chance of contracting and relapsing from viral infections can be predicted using serum vitamin D levels.[6]

**Vitamin D and methods for reducing the incidence of viruses:**

Many methods by which form of vitamin D lowers the chance of bacterial infections have been clarified by recent reviews. Vitamin D provides protection against infection and mortality in a number of ways. By lowering the vitamin D lowers the risk of colds in three different ways: through the physical barrier, cellular natural immunity, and adaptive immunity. Vitamin D may lessen the risk of COVID-19 infections and death. according to a recent review [9].

**Corona viruses and vitamin D:**

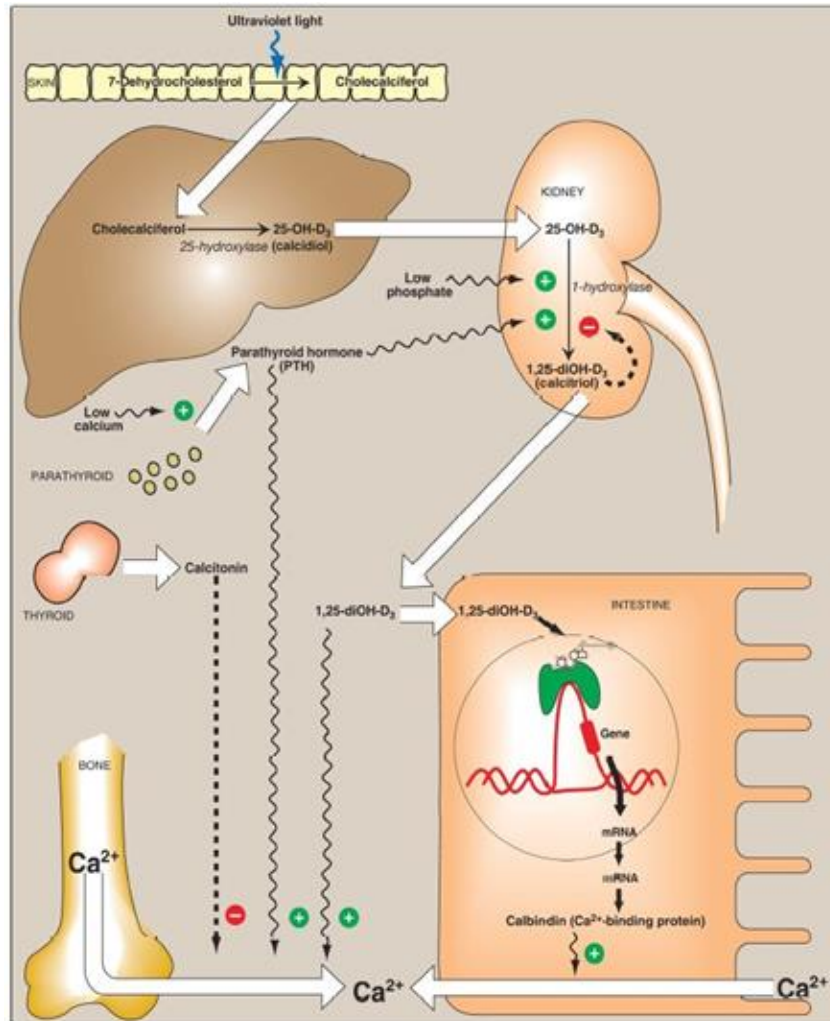
Many clinical and epidemiological studies provide evidence in favor of the hypothesis that vitamin D levels and COVID-19 are related. According to current study, COVID-19 is associated with elevated levels of pro-inflammatory cytokines, pneumonia, ARDS, heart failure, and CRP [7]. Chronic respiratory tract disease, diabetes, hypertension, and cardiovascular disease were associated with a six to ten percent chronic fatality rate in China. Multiple studies have demonstrated a negative correlation between blood 25(OH)D concentrations and pro-inflammatory cytokines, IL-6, elevated CRP, and an increased risk of heart failure, diabetes, pneumonia, and respiratory distress syndrome that is acute (ARDS). Controlled trials with randomization have shown that vitamin D supplementation lowers the prevalence of respiratory diseases. Taking doses of vitamin D greatly lowers the occurrence of respiratory tract infections, according to a placebo-controlled experiment with 5,660 individuals.

**Toxicology of Vitamin D:**

Hypervitaminosis D is the alternative term for this uncommon but potentially deadly disorder, which is caused by an excess of vitamin D in the body. Rather than being brought on by food or sun exposure, vitamin D poisoning is typically the result of taking high doses of supplements. Even fortified meals don't contain too much vitamin D because your body controls how much of the nutrient is created by sun exposure. The most common side effect of Hypercalcemia, or too much calcium in the blood, is a symptom of vitamin D poisoning and can lead to fatigue, nausea, and frequent urination problems.. Intoxication with vitamin D can cause kidney difficulties, including soreness in the bones, as well as calcium stones.

Treatment entails addressing calcium limitation and vitamin D deficiency. A doctor may also advise intravenous fluids, corticosteroids, or bisphosphonates in addition to intravenous fluids if studies reveal that taking 60,000 IU of vitamin D every day for several months could make you toxic. The 600 IU Recommended Dietary Allowance (RDA) for vitamin D is significantly less than what most Americans actually need.

Vitamin D Metabolism and Activity Ergocalciferol, which is sometimes known as vitamin D<sub>2</sub>, and cholecalciferol, which is also called vitamin D<sub>3</sub>, are the two primary forms (Fig. 1). They travel to the liver, where they are converted into the two main circulating forms of vitamin D that are found in most tests, specifically Vitamin D<sub>3</sub> and D<sub>2</sub> with a 25 hydroxy acid concentration. Vitamin D<sub>2</sub> and D<sub>3</sub> (calcitriol) are produced by the kidney through a second hydroxylation pathway. Vitamin D that is activated types have three major functions: they promote the absorption of calcium and phosphate from the small intestine, mineralize the bone matrix, and block the synthesis and secretion of parathyroid hormones.[9]



**Figure 1: The functions and metabolism of vitamin D. [Note: By preventing mobilization from bone, absorption from the gut, and reabsorption by the kidney, the thyroid hormone calcitonin lowers blood calcium ( $\text{Ca}^{2+}$ ). It is against PTH's actions.] messenger RNA (mRNA); 25-hydroxycholecalciferol (25-OH-D<sub>3</sub>); and 1,25-dihydroxycholecalciferol (1,25-dihydroxyvitamin D<sub>3</sub>). [15]**

## MATERIALS AND WORKING METHODS:

we will discuss the practical aspect that we did in the hospital from collecting samples and materials that we used in collecting samples and equipment that we used in the analyzes. We used the Gel tube in vitD test and we used the Visible Spectrometer device in also in terms of use, the workers in the laboratory in the hospital helped us in how to work. On the one hand, this device and other devices there are many types of them The visible spectrum instrument in a currency contains some equations to calculate the output. The amount of light that flows through a particular solution is measured quantitatively by a spectrophotometer. A monochromator in a spectrophotometer chooses a single wavelength from the continuous spectrum when light from a lamp is sent through it. After passing this light through the sample that needs to be examined, the photodiode or any other type of photodetector is used to measure the light's intensity, and the transmittance at this wavelength is computed.

## ESR analysis

The normal ESR reading, which expresses the amount of plasma in the top of the test tube after one hour, is 1 mm/hour if the ESR reading is less than 15 mm/h in the case of men. less than 20 mm/hour in females, or the same. less than or equivalent to 10 mm/h in young people

**(Result and Discussion)**

**An experiment showing the effect of vitamin D**

After confirming the patients' infection, isolating them in isolation rooms, doing the required tests on them, and performing clinical assessments, we performed an experiment on a group of patients (see Table 1) who had the novel Corona illness as their primary infection. Together with weakness, there was a notable drop in vitamin D levels. We chose to give them vitamin D-containing drugs and allow them to heal because of their weakened immune systems.

Following no more than four days of treatment, we observed a noteworthy reaction, the immune system considerably recovered, and some patients recovered totally in a short amount of time. All of these findings led us to consider whether or not the vitamin was really necessary. D: Because it strengthens the immune system, it is beneficial for healthy individuals [12–14].

**Test percentages before and after treatment:**

patient	Age	gender
Patient 1	20	Female
Patient 2	28	Female
Patient 3	35	Female
Patient 4	32	Female
Patient 5	30	Female

Vitamin D		ESR	
Before	After	Before	After
11.04ng/ml	32.13	32mg/l	19mg/l
12.32ng/ml	23.70	27mg/l	18mg/l
10.55ng/ml	20.01	30mg/l	25mg/l
23.01ng/ml	17.14	22mg/l	17mg/l
16.17ng/ml	19.07	35mg/l	20mg/l

**Conclusions:**

Even with several positive outcomes, vitamin D cannot be completely relied upon to protect the body and treat corona because it fortifies the immune system's ability to combat the condition. In certain tests, it was discovered that although the body's vitamin D level is normal or nearly normal, a viral infection has left the body lethargic and exhausted. In [14]

**Recommendations:**

A vitamin D deficiency can cause infection with the current corona pandemic directly because of its deleterious effects on the immune system. From the moment an illness occurs, vitamin D has the ability to strengthen immunity against disease.

It also operates on T cells to prevent inflammation and lower blood iron levels, which in turn lowers the components that the virus feeds on. Like other antibiotics, continuing to take vitamin D without a prescription has detrimental effects. You need to keep an eye on your vitamin D levels whenever you sense inflammation or a health issue because low levels of this vitamin can lead to serious symptoms, such as weakened immunity, which is the gateway to all illnesses.

**References:-**

1. nutrints, (2020)" "Efficiency of Vitamin D Supplementation in Health- Adults", <http://www.mdpi.com/journal/nutrints>

2. Kathy Co. (2015) British Journal of Midwifery "The importance of vitamin D", <https://www.researchgate.net/publication/281197629>
3. Nurshad Ali (2020) "Role of vitamin D in preventing of COVID-19 infection, progression and severity" <http://www.mdpi.com/journal/nutrients>
4. Nurshad Ali (2020) "Vitamin D and mechanisms to decrease viral infections" P[4]
5. Christesen HT, Falkenberg T, Lamont RF, Jørgensen JS (2012) The impact of vitamin D on pregnancy  
A systematic review. *Acta Obstet Gynecol Scand* 91(12): 1357-67. doi: 10.1111/aogs.12000
6. Davies JH, Shaw NJ (2011) Preventable but no strategy: vitamin D deficiency in the UK. *Arch Dis Child* 96(7): 614-5. doi: 10.1136/adc.2010.191627
7. Dovepress, (2020) "Effects of Vitamin D on COVID-19 Infection" <https://www.dovepress.com/getfile.php?fileID=65434>
8. AUBMC (American university of Beirut center), 2020 vit-d.pdf A
9. Devina Joshi, Bone and Calcium Registrar, 1,2 Jacqueline R Center, Associate Professor of Medicine (Conjoint), 3 Staff Endocrinologist1 and Senior Research Fellow,2 and John A Eisman, Professor of Medicine (Conjoint).3 Staff Endocrinologist 1 and Director2 <https://www.nps.org.au/assets/fd933f056dfaca80-84c394692227-8970e90c9a25534f5fcf4cdf407f739e5795ca67319ddba10c4a2c32cd13.pdf>
10. Katherine Zeratsky, R.D., L.D. (2020) "Vitamin D toxicity
11. Charoenngam N, Holick MF. Immunologic effects of vitamin D on human health and disease. *Nutrients*. 2020; 12(7): 2097
12. Martineau AR, Jolliffe DA, Hooper RL, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. *BMJ*. 2017; 356:16583
13. Ali N. Role of vitamin D in preventing of COVID-19 infection, progression and severity *J Infect Public Health*. 2020; 14(20):30531-4. Grant WB, Lahore H, McDonnell SL, et al. Evidence that vitamin D supplementation could reduce risk of influenza and COVID-19 infections and deaths. *Nutrients*. 2020; 12(4): 988
14. Vitamin D : Metabolism <https://almerja.com/more.php?idm=161828>
15. Abboud, Myriam; Al Anouti, Fatme; Papandreou, Dimitrios; Rizk, Rana; Mahboub, Nadine; Haidar, Suzan (February 22, 2021). "Vitamin D status and blood pressure in children and adolescents: a systematic review of observational studies." *Systematic Reviews*. C. 10 p. 1: 60. DOI:10.1186/s13643-021-01584-x. ISSN:2046-4053. PMC:7898425. PMID:33618764. Archived from the original on 2024-03-06.
16. Jump up to: A B Buttigliero C, Monagheddu, C, Petroni, P, Saini, A, Dogliotti, L, Ciccone, G, Berruti, A (2011). "Prognostic role of vitamin D status and efficacy of vitamin D supplementation in cancer patients: a systematic review". *The oncologist*. C. 16 p. 9:1215-27. DOI:10.1634/theoncologist.2011-0098. PMID:21835895.
17. "Vitamin D and Cancer Prevention - National Cancer Institute." *Cancer.gov*. June 16, 2010. Archived from the original on 02-13-2015. Viewed on 2012-06-13.
18. BBC NEWS | Health | Vitamin D 'may help slow aging' Archived March 9, 2018 on Wayback Machine.
19. Beard JA, Bearden, A, Striker, R (2011). "Vitamin D and the anti-viral state". *Journal of clinical virology: the official publication of the Pan American Society for Clinical Virology*. C. 50 p. 3: 194-

200. DOI:10.1016/j.jcv.2010.12.006. PMID:21242105. {{Refereed journal citation}}: Unknown medium |month= ignored Suggest using |date= (help)
20. L Bishop, Emma; Ismailova, Aiten; Dimeloe, Sarah; Hewison, Martin; White, John H. (2021-01). "Vitamin D and Immune Regulation: Antibacterial, Antiviral, Anti-Inflammatory". *JBMR plus*. C. 5 p. 1:e10405. DOI:10.1002/jbm4.10405. ISSN:2473-4039. PMC:7461279. PMID:32904944. Archived from the original on January 7, 2024.
21. Noaham KE, Clarke A (2008). "Low serum vitamin D levels and tuberculosis: a systematic review and meta-analysis". *International Journal of Epidemiology*. C. 37 p. 1: 113–9. DOI:10.1093/ije/dym247. PMID:18245055. {{Refereed journal citation}}: Unknown medium |month= ignored Suggest using |date= (help)
22. Skip up to: A B Luong K, Nguyen, LT (2011). "Impact of vitamin D in the treatment of tuberculosis". *The American journal of the medical sciences*. C. 341 p. 6: 493–8. DOI:10.1097/MAJ.0b013e3182070f47. PMID:21289501. {{Refereed journal citation}}: Unknown medium |month= ignored Suggest using |date= (help)
23. Hart, P. H. (2012 Jun). "Vitamin D supplementation, moderate sun exposure, and control of immune diseases." *Discovery medicine*. C. 13 p. 73: 397–404. PMID:22742645.
24. Paul G, Brehm, JM, Alcorn, JF, Holguín, F, Aujla, SJ, Celedón, JC (2012). "Vitamin D and asthma". *American Journal of Respiratory and Critical Care Medicine*. C. 185 p. 2: 124–32. DOI:10.1164/rccm.201108-1502CI. PMID:22016447. {{Refereed journal citation}}: Unknown medium |month= ignored Suggest using |date= (help)
25. Amor KT, Rashid RM, Mirmirani P (2010). "Does D matter? The role of vitamin D in hair disorders and hair follicle cycling." *Dermatology online journal*. C. 16 p. 2. PMID:20178699.
26. Williamson, Anne; Martineau, Adrian R.; Sheikh, Aziz; Jolliffe, David; Griffiths, Chris J. (February 6, 2023). "Vitamin D for the management of asthma". *The Cochrane Database of Systematic Reviews*. C. 2 p. 2: CD011511. DOI:10.1002/14651858.CD011511.pub3. ISSN:1469-493X. PMC:9899558. PMID:36744416. Archived from the original on January 7, 2024.
27. Jump up to:a b Del Pinto, Rita; Pietropaoli, David; Chandar, Apoorva K.; Ferri, Claudio; Cominelli, Fabio (2015-11). "Association Between Inflammatory Bowel Disease and Vitamin D Deficiency: A Systematic Review and Meta-analysis". *Inflammatory Bowel Diseases*. C. 21 p. 11:2708–2717. DOI:10.1097/MIB.0000000000000546. ISSN:1536-4844. PMC:4615394. PMID:26348447. Archived from the original on 03-27-2024.