



Vitamin D3 Role in the Enhancement Immunity of COVID-19 Vaccinated Individuals

Nemat Khansari DVM, PhD^{1,2*}

¹Department of Immunology, Tehran Medical Science University, Iran

²Sattarkhan Medical Diagnostic Laboratory, Iran

***Corresponding author:** Nemat Khansari DVM, Department of Immunology, School of Medicine, Tehran Medical Science University, Tehran, Iran, Email: nkhangsari928@gmail.com

Review Article

Volume 8 Issue 1

Received Date: April 18, 2023

Published Date: May 09, 2023

DOI: 10.23880/vvoa-16000157

Short Communication

Despite of having several effective COVID-19 vaccines such as Pfizer-BioNTech, Moderna, AstraZeneca, Sputnik V, and Sinopharm as examples, by now, we know that COVID-19 infection will stay with us for a long time similar to influenza and many other viral infections. Widespread vaccination has limited morbidity and mortality of the COVID-19 considerably, but based on WHO Dashboard report almost all nations still report noticeable epidemic. Among them, those countries which used non-mRNA vaccines, like Iran which is currently fighting the 8th peak of COVID-19 infection. Outbreak of several mutated COVID-19 viruses and low efficacy of the vaccines used as well as not receiving updated booster shot may be some of factors for persistent epidemic of COVID-19 infections. In addition to the mentioned factors, we know that not all of the present vaccines are efficient enough to induce sufficient and long-lasting immunity especially those which provoke humoral immunity and have less effect on cellular immunity of the vaccinated individuals [1,2].

My personal observations, presented here, on more than 1500 patients in the past two years might shed lights in factors important, if not crucial, in morbidity and mortality as well as persistence of COVID-19 epidemic and/or infection of vaccinated individual with severe symptoms.

Among 1500 COVID-19 patients who had received at least two COVID-19 vaccines shots in Tehran, Iran, 45% experienced at least one-time COVID-19 infection. Twenty-three percent (23%) of these patients showed severe symptoms and were hospitalized. Testing blood sample from all these 1500 patients showed that only 20% had above 30 nmole/L vitamin D3. The serum level of vitamin D3 of those

who got infected following vaccination was less than 30 nmole/L and those who were hospitalized was less than 20 nmole/L. These observations indicate importance of vitamin D3 in immunity of individuals against COVID-19 infection even after vaccination.

It has been shown that vitamin D plays important roles in bone development, enhances calcium absorption in the small intestine and increases osteoclast differentiation as well as calcium re-absorption of bone [3,4]. However, recent investigations in non-classical function of vitamin D specially in its hydroxylated form which is active form, namely vitamin D3 (1, 25 dihydroxy vitamin D), shows immunomodulatory effects [5]. This function is due to presence of vitamin receptors on immune cells such as monocytes, macrophages and T cells. Vitamin D, by reducing pro-inflammatory cytokines production of macrophages, exerts anti-inflammatory response [6,7]. It has also been shown that vitamin D regulates T-cell proliferation by controlling T-cell antigen receptors, T-cell activation and enhancing the phagocytic activation of macrophages [8]. Recently, it has been reported that low vitamin D level is associated with production of autoantibody, hence, incidence of autoimmune diseases such as rheumatoid arthritis, multiple sclerosis, and systemic lupus erythematosus [9], and increase risk factor of microbial and viral infections [10]. Ayelin, et al. reported that vitamin D induces expression of cathelicidin (LL-37) a peptide that enhances antimicrobial function of macrophages and polymorphonuclear leukocytes in humans. LL-37 has the ability to neutralize bacterial endotoxins and capsular polysaccharides that activate Toll-Like receptors signaling pathways leading to inhibition of pro-inflammatory cytokines from macrophages [11].

These findings are consistent with my observations reported in this article. It also should be noted that COVID-19 patients who received daily high doses of vitamin C (3000 IU) and vitamin D3 (4000 IU) showed faster recovery from infection, and those vaccinated individuals who used similar doses of vitamins C and D3, during epidemic's peaks periods, if infected with mutated COVID-19 Omicron subvariants BA.4 Or BA.5, suffered from very mild infection and limited symptoms [12].

It should be noted that Gorton & Jarvis studies have shown effectiveness of vitamin C in preventing and relieving the symptoms of virus-induced respiratory infections [13].

Conclusion

Keeping sufficient serum level of Vitamins D3 and C for prevention of microbial and viral infections as well as enhancement of immunity following vaccination would be highly beneficial. In addition, prescribing these vitamins in high dose for COVID-19 patients induces less severe symptoms and lower recovery time of the patients.

Acknowledgement

Author express appreciation to the director and supervisor of Sattarkhan medical diagnostic laboratory for their assistance and data contribution for this communication.

References

- Gao F, Mallajoyula V, Arunachalam PS, Manohar M, Röltgen K, et al. (2023) Spheromers reveal robust T cell responses to the Pfizer/BioNTech vaccine and attenuated peripheral CD8+ T cells response post SARS-Co-2 infections. *Immunity* 56(4): 864-878.
- Sadarangani M, Marchant A, Kollmann TR (2021) Immunological mechanisms of vaccine-induced protection against COVID-19 in human. *Nature Immunol* 21: 475-484.
- Harrison SR, Li D, Jeffery LE, Raza K, Hewison M, et al. (2020) Vitamin D, autoimmune disease and rheumatoid arthritis. *Calcif Tissue Int* 106(1): 58-75.
- Dimitrov R, Salehi-Tabar BS, White HJ (2014) Non-classical mechanisms of transcriptional regulation by the vitamin D receptor: Insights into calcium homeostasis, immune system regulation and cancer chemoprevention. *J Steroid Biochem and Molec Biol* 144: 74-80.
- Arnow C (2011) Vitamin D and the immune system. *J Investig Med* 59(6): 881-886.
- Holick MF (2007) Vitamin D deficiency. *N Engl J Med* 357(3): 266-268.
- Dankers W, Gonzalez-Leal C, Davelaar N, Asmawidjaja PS, Mus AMC, et al. (2018) 1,25(OH)2D3 and dexamethasone additively suppress synovial fibroblast activation by CCR6(+) T helper memory cells and enhance the effect of tumor necrosis factor alpha blockade. *Arthritis Res Ther* 20(1): 212.
- Wasnik S, Sharma I, Baylink DJ, Tang X (2020) Vitamin D as a potential therapy for multiple sclerosis: where are we. *Int J Mol Sci* 21(9): 3102.
- Dall'Ara F, Cutolo M, Andreoli L, Tincani A, Paolino S, et al. (2018) Vitamin D and systemic lupus erythematosus: a review of immunological and clinical aspects. *Clin Exp Rheumatol* 36(1): 153-162.
- Feketea G, Bocsan CI, Stanciu LA, Buzoianu AD, Zdrenghia MT, et al. (2020) The role of vitamin D deficiency in children with recurrent wheezing-clinical significance. *Front Pediatr* 8: 344-350.
- Ayalign B, Workneh M, Molla MD (2020) Dessie G. Role of vitamin-D supplementation in TB/HIV co-infected patients. *Infect Drug Resist* 13: 111-118.
- Zughaier SM, Lubberts E, Bener A (2020) Editorial: Immune-modulatory effects of vitamin D. *Frontiers Immunol* 11: 596611-596613.
- Gorton HC, Jarvis K (1999) The effectiveness of vitamin C in preventing and relieving the symptoms of virus-induced respiratory infections. *J Manip Physiol Ther* 22(8): 530-533.

