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ORIGINAL ARTICLE

Vitamin D Deficiency and Adverse Results in COVID-19

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ABSTRACT

Aim: The goal of this study is to find out how common vitamin D deficiency is in patients with corona virus disease and what the consequences are.

Study Design: Observational /Prospective

Place and Duration: Institute of Basic medical sciences, Khyber Medical University (KMU), Jan 2021-Oct 2021.

Materials & Methods: This study included 120 patients of both genders who had been diagnosed with covid-19. Patients ranged in age from 15 to 75 years. After receiving written agreement, demographically detailed such as age, sex, and BMI were recorded. All of the patients had a 5 mL blood sample obtained to check their vitamin D levels. 25(OH)D < 25 nmol/L (10 ng/dL) was considered severe Vitamin D insufficiency. The prevalence of vitamin D insufficiency as well as negative effects were investigated. SPSS 23.0 was used to analyse the data.

Results: The mean age of the 120 patients was 40.11±8.64 years, with 68 (56.7%) males and 52 (43.3%) females. There were 52 patients (43.3%) with severe vitamin D insufficiency. There were 17 deaths of the total number of patients in the study. Vitamin D deficiency was associated with a higher mortality rate in patients with covid-19 disease than in those who had normal levels of vitamin D, a finding that was statistically significant at the 0.05 level.

Conclusion: It was found that severe deficiency of vitamin D and death in individuals with covid-19 illness had a strong association.

Keywords: Mortality, Vitamin D Deficiency, Covid-19,

INTRODUCTION

The coronavirus infection has spread throughout the world. On February 11, 2020, in Wuhan, Hubei, China, the World Health Organization (WHO) designated the outbreak as COVID-19, the first time the term has been used. [1,2] Sickness with SARS-CoV-2, a virus that threatens to wipe out the whole human population, has been linked to this infection. [3] While 17.9 percent of COVID-19 infections were moderate, and only 15.7 percent had a serious illness after being admitted to the hospital, there is a wide variety of clinical characteristics among those who contracted the virus. The majority of patients with serious sickness did not have any radiologic abnormalities found when they were first admitted to the hospital. [4]

The immune system's health is affected by a variety of factors, which can increase the risk of viral infections such as COVID-19, which can cause death and serious disease. It is necessary for the immune system to function properly in order for it to be adequately nourished [5]. Vitamin D has been established in a number of recent studies [6,7] to be an important supportive factor for immune system function, particularly in the regulation of inflammation in response to viral infection. Vitamin D is a fat-soluble vitamin that has a substantial impact on the body's immune system, both on the innate and adaptive sides. Vitamin D is essential for bone health. A sufficient amount of vitamin D has also been shown in earlier research to reduce the incidence of viral respiratory infections and the length of hospital stay [8]. While vitamin D supplementation may reduce the risk of COVID-19 infection, the exact effect of vitamin D supplementation in lowering the risk of infection is still being researched [9].

To protect against COVID-19, it's probable that vitamin D will be required in some cases. Recently, it has been discovered that vitamin D has anti-inflammatory and immunomodulatory properties. As a result of this relationship, vitamin D has the power to influence immune systems that are created and acquired in response to bacterial and viral invasions. It is necessary for vitamin D to bind with its receptor in order to be effective (VDR).[10] As part of its function, it inhibits the activity of the enzyme ACE-2 while also controlling the renin-angiotensin system. As a result, in the treatment of COVID-19, vitamin D may be beneficial in preventing cytokine storm and, as a result, acute respiratory distress syndrome (ARDS), which are two of the most common causes of death.

The purpose of the current investigation was to determine whether there is a link between severe vitamin D insufficiency and death in individuals who have been diagnosed with severe Covid-19 illness.

MATERIALS AND METHODS

An observational/prospective study was carried out at Institute of Basic medical sciences, Khyber Medical University (KMU). Enrollment in this trial was open to both male and female patients diagnosed with severe covid-19. After obtaining written agreement, we collected demographic data on each participant, including their age, gender, and height/weight. Excluded from the study were patients taking vitamin D supplements and those who had not given their consent.

All of the patients were subjected to real-time PCR testing in order to pinpoint the presence of covid-19 illness. All patients had their vitamin D levels tested with a 5 ml blood sample. 25(OH)D 25 nmol/L (10 ng/dL) was considered as severe Vitamin D insufficiency. A link was found between a low level of vitamin D and an increased risk of death. In SPSS 23.0, all of the data was analysed and interpreted. Tables were used to record percentages and frequencies. Vitamin D deficiency and death were studied using chi-square tests. Significant results were defined as those with a p-value less than 0.05.

RESULTS

The mean age of the 120 patients was 40.11±8.64 years, with 68 (56.7%) males and 52 (43.3%) females. Mean BMI of the patients was 24.11±6.12 kg/m^2. (Table 1)

Table No 1: All the patients' demographic information.

Characteristics	Frequency No.	%age
Age	42.46±14.73	
Body Mass index	24.11±6.12	
Sex		
Male	68	56.7
Female	52	43.3

There were 52 patients (43.3%) with severe vitamin D insufficiency. (Figure 1)

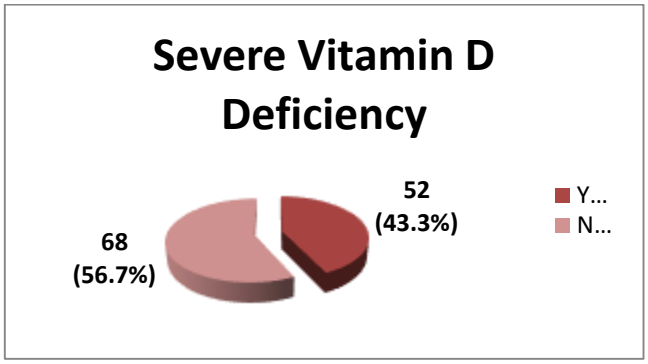

Figure No 1: Deficiency of vitamin D

There were 17 deaths out of the total number of patients in the trial, which was a small number. Patient's with covid-19 disease who were vitamin D deficient died at a higher rate than those who were vitamin D sufficient, which was statistically significant at the 0.05 level, according to the study's findings. (Table 2)

Table No 2: Mortality and Vitamin D deficiency

Characteristics	Deficiency of vitamin D		P-value
	Yes (n=52)	No(n=68)	
Died			0.02
Yes	12 (23.7%)	5 (7.4%)	
No	40 (76.3%)	63 (92.6%)	

DISCUSSION

A number of studies have discovered a relationship between low vitamin D levels and seasonal respiratory infections. Vitamin D supplementation, which has been demonstrated to improve one's immune system, may be effective in preventing COVID-19 infection and infection with COVID-19. [11-13] In the northern hemisphere, where vitamin D deficiency is common, it is assumed that the COVID-19 pandemic originated [14]. This year's epidemic of COVID-19 took place over the winter season. Following the publication of these findings, researchers came up with the notion of using vitamin D to prevent COVID-19 infection or to treat COVID-19 patients who had contracted the virus.

One hundred and twenty participants with coronavirus illness were enrolled in this study, which was conducted in a prospective or observational manner. 68 (56.7 percent) of the patients were men, and 52 (43.3 percent) were women, with a mean age of 40.118.64 years. The patients' average body mass index (BMI) was 24.116.12 kg/m2. It was found that the results of this investigation were in line with those of previous studies. [15,16]

In this study, 52 (43.3 percent) of the patients had severe vitamin D deficiency, whereas 68 (56.7 percent) of the patients had vitamin D levels greater than 25 nmol/L. Recent investigations investigating the association between 25(OH) vitamin D levels in the blood and the prevalence and severity of COVID-19 are scarce. According to Maghbooli et al. and Panagiotou1 et al., patients infected with COVID-19 who consume adequate vitamin D are less likely to have worse clinical outcomes as compared to those who consume insufficient vitamin D. [17,18]. According to Azadeh et al., there were no differences in vitamin D levels between SARS CoV-2 RT-PCR positive 2345 persons and 11,585 non-infected controls. However, Brando et al. discovered lower vitamin D levels in 80 COVID-19 patients than in 70 healthy individuals. [19,20]

We found that 17 patients (14.7 percent) died as a result of their illness in our research. Those with severe vitamin D deficiency showed a higher death rate than patients with no vitamin D deficiency, 12 (23.1 percent) compared to 5. (7.4 percent). Patients with covid-19 illness who had a p-value of less than 0.05 were shown to have higher mortality rates when they had severe vitamin D deficiency. Anti-Sars-CoV-2 infection may be prevented by vitamin D, which has been shown to affect numerous pathophysiological processes. Vitamin D (via its receptor) has the ability to have a direct impact on a range of pathways, making a determination of its function in the course and severity of SARS-CoV-2 infection critical. [21]

According to our systematic study [22,23], using vitamin D supplements may be beneficial in preventing COVID-19 infection. Particularly important for persons who live in areas where vitamin D insufficiency is frequent is the importance of getting enough sunlight. Patients with severe vitamin D deficit died at a greater rate than patients with no vitamin D deficiency, with 12 (23.1 percent) dying compared to 5 in the control group (7.4 percent). Patients with covid-19 disease who had a p-value less than 0.05 were found to have increased mortality rates when they were suffering from severe vitamin D deficiency, according to the findings of the study. A vitamin D supplement may be effective in preventing anti-Sars-CoV-2 infection, as vitamin D has been found to have an impact on a variety of pathophysiological processes. Given that vitamin D (via its receptor) has the ability to have a direct impact on a variety of pathways, determining its role in the course and severity of SARS-CoV-2 infection is crucial to understanding the virus. [21]

CONCLUSION

Vitamin D is essential in the prevention of any serious illness.. Patients with a significant vitamin D insufficiency were observed in 43.3 percent of the patients. Low vitamin D levels have also been linked to an increased risk of death in several studies. When comparing patients with severe Vitamin D insufficiency to those with vitamin D levels greater than 25 nmol/L, it was shown that the mortality rate was increased.

REFERENCE

1 Zhu, N, Zhang, D, Wang, W, et al. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med 2020; 382(8): 727–733.
2 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
3 Guo, YR, Cao, QD, Hong, ZS, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak an update on the status. Mil Med Res 2020; 7(1): 11.
4 Guan, W, Ni, Z, Hu, Y, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med 2020; 382: 1708–1720.
5 Patel N, Penkert RR, Jones BG, Sealy RE, Surman SL, Sun Y, Tang L, DeBeauchamp J, Webb A, Richardson J, et al. Baseline Serum Vitamin A and D Levels Determine Benefit of Oral Vitamin A&D Supplements to Humoral Immune Responses Following Pediatric Influenza Vaccination. Viruses. 2019;11(10):907
6 Banerjee A, Ganguly U, Saha S, Chakrabarti S, Saini RV, Rawal RK, et al. Vitamin D and immuno-pathology of COVID-19: many interactions but uncertain therapeutic benefits. Expert Rev Anti-Infect Ther. 2021:1–14
7 Beard JA, Bearden A, Striker R. Vitamin D and the anti-viral state. J Clin Virol. 2011;50(3):194–200.
8 Panagiotou G, Tee SA, Ihsan Y, Athar W, Marchitelli G, Kelly D, et al. Low serum 25-hydroxyvitamin D (25[OH]D) levels in patients hospitalized with COVID-19 are associated with greater disease severity. Clin Endocrinol. 2020;93(4):508–11
9 Pham H, Rahman A, Majidi A, Waterhouse M, Neale RE. Acute Respiratory Tract Infection and 25-Hydroxyvitamin D Concentration: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2019;16(17):3020.
10 McCartney, DM, Byrne, DG. Optimisation of Vitamin D Status for Enhanced Immuno-protection Against Covid-19. Ir Med J 2020; 113(4): 58.
8 Shalimar, Elhence A, Vaishnav M, et al. Poor outcomes in patients with cirrhosis and Corona Virus Disease-19. Indian J Gastroenterol. 2020;39(3):285-291. doi:10.1007/s12664-020-01074-3
9 Iavarone M, D'Ambrosio R, Soria A, et al. High rates of 30-day mortality in patients with cirrhosis and COVID-19. J Hepatol 2020.

doi:doi:10.1016/j.jhep.2020.06.001. [Epub ahead of print: 08 Jun 2020].pmid:http://www.ncbi.nlm.nih.gov/pubmed/32526252

10 Du RH, Liang LR, Yang CQ, Wang W, Cao TZ, Li M, et al. Predictors of mortality for patients with COVID-19 pneumonia caused by SARS-CoV-2: a prospective cohort study. Eur Respir J. 2020 May 7;55(5):2000524. Erratum in: Eur Respir J. 2020 Sep 24;56(3): pmid:32269088

11 Mathyssen C, Aelbrecht C, Serré J, Everaerts S, Maes K, Gayan-Ramirez G, et al. Local expression profiles of vitamin D-related genes in airways of COPD patients. Respir Res. 2020;21:1–10.

12 Jolliffe D, Camargo CA, Sluyter J, Aglipay M, Aloia J, Bergman P, et al. Vitamin D supplementation to prevent acute respiratory infections: systematic review and meta-analysis of aggregate data from randomised controlled trials. Lancet Diab Endocrinol. 2021;9(5):276–92

13 Xu J, Yang J, Chen J, Luo Q, Zhang Q, Zhang H. Vitamin D alleviates lipopolysaccharide-induced acute lung injury via regulation of the renin-angiotensin system. Mol Med Rep. 2017;16(5):7432–8.

14 Martineau AR, Forouhi NG. Vitamin D for COVID-19: a case to answer? Lancet Diab Endocrinol. 2020;8(9):735–6.

15 Davoudi, A., Najafi, N., Aarabi, M. et al. Lack of association between vitamin D insufficiency and clinical outcomes of patients with COVID-19 infection. BMC Infect Dis **21,** 450 (2021).

16 Davoudi A, Najafi N, Aarabi M, Tayebi A, Nikaeen R, Izadyar H, Salar Z, Delavarian L, Vaseghi N, Daftarian Z, Ahangarkani F. Lack of association between vitamin D insufficiency and clinical outcomes of patients with COVID-19 infection. BMC Infect Dis. 2021 May 18;21(1):450.

17 Maghbooli Z, Sahraian MA, Ebrahimi M, Pazoki M, Kafan S, Tabriz HM, et al. Vitamin D sufficiency, a serum 25-hydroxyvitamin D at least 30 ng/mL reduced risk for adverse clinical outcomes in patients with COVID-19 infection. PLoS One. 2020;15(9):e0239799.

18 Panagiotou G, Tee SA, Ihsan Y, Athar W, Marchitelli G, Kelly D, et al. Low serum 25-hydroxyvitamin D (25[OH]D) levels in patients hospitalized with COVID-19 are associated with greater disease severity. Clin Endocrinol. 2020;93(4):508–11.

19 Azadeh H, Hedayatizadeh-Omran A, Saeedi M, Vahedi-Larijani L, Mehravaran H, Heydari K. Serum vitamin D concentrations in CoVID19 patients. J Mazandaran Univ Med Sci. 2021;31(195):30–6.

20 Brandão C, Chiamolera MI, Biscolla RPM, Lima JVJ, De Francischi Ferrer CM, Prieto WH, de Sá Tavares Russo P, de Sá J, Dos Santos Lazari C, Granato CFH et al. No association between vitamin D status and COVID-19 infection in São Paulo, Brazil. Arch Endocrinol Metab 2021,

21 Quesada-Gomez JM, Entrenas-Castillo M, Bouillon R. Vitamin D receptor stimulation to reduce acute respiratory distress syndrome (ARDS) in patients with coronavirus SARS-CoV-2 infections. J Steroid Biochem Mol Biol. (2020) 202:105719

22 Ebadi, M.; Montano-Loza, A.J. Perspective: Improving vitamin D status in the management of COVID-19. Eur. J. Clin. Nutr. 2020, 74, 856–859

23 McCartney, D.M.; Byrne, D.G. Optimisation of vitamin D status for enhanced Immuno-protection against Covid-19. Ir. Med. J.2020, 113, 58