

ASSOCIATION OF VITAMIN D STATUS WITH SEVERITY OF COVID 19

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Abstract

Background: The present study was undertaken for assessing the association of serum vitamin D level with severity grading in COVID 19 RT-PCR positive patients. **Materials & methods:** 50 Patients diagnosed to have COVID 19 infection above age of 18 years admitted in COVID positive ward and COVID positive ICU were enrolled. Complete demographic and clinical details of all the patients were recorded. Serum vitamin D levels were assessed using auto-analyser and were correlated with severity of COVID-19. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. **Results:** Mean serum vitamin D levels among patients with mild, moderate, severe and critically ill COVID-19 was 33.4 ng/mL, 28.2 ng/mL, 23.2 ng/mL and 19.5 ng/mL respectively. Significant results were obtained while comparing mean serum Vitamin D levels among different severity of COVID-19. **Conclusion:** The overlap in the vitamin D associated biological pathways with the dysregulation reported to drive COVID-19 outcomes warrants further investigation, as does the role that vitamin D levels at time of presentation of COVID-19 may have as predictive biomarkers of disease severity.

Key words: COVID-19, Vitamin D

INTRODUCTION

The symptoms of 2019-nCoV infection were nonspecific. The most common symptoms were onset of fever, generalized weakness and dry cough. Some patients had headache and/or myalgia, but upper respiratory symptoms such as runny nose were rare. Diarrhea was often identified, which had been reported 10.6% in SARS and up to 30% in MERS. More than half of patients developed shortness of breath, the median duration from disease onset to dyspnea was 8 days. Patients infected with 2019-nCoV might develop acute respiratory distress syndrome (ARDS), followed by septic shock, refractory metabolic acidosis and coagulation dysfunction, if the disease could not be controlled.¹⁻⁴

Notably, some patients were afebrile or confirmed biologically to have an asymptomatic infection. These cryptic cases of walking pneumonia might serve as a possible source to propagate the outbreak. Further studies on the epidemiological significance of these asymptomatic cases are warranted.⁵⁻⁷

Vitamin D is unique because it can be made in the skin from exposure to sunlight. Vitamin D exists in two forms. Vitamin D₂ is obtained from the UV irradiation of the yeast sterol ergosterol and is found naturally in sun-exposed mushrooms. UVB light from the sun strikes the skin, and humans synthesize vitamin D₃, so it is the most "natural" form. Human beings do not make vitamin D₂, and most oil-rich fish such as salmon, mackerel, and herring contain vitamin D₃. Vitamin D (D represents D₂, or D₃, or both) that is ingested is incorporated into chylomicrons, which are absorbed into the lymphatic system and enter the venous blood. Vitamin D that comes from the skin or diet is biologically inert and requires its first hydroxylation in the liver by the vitamin D-25-hydroxylase (25-OHase) to 25(OH)D. However, 25(OH)D requires a further hydroxylation in the kidneys by the 25(OH)D-1-OHase (CYP27B1) to form the biologically active form of vitamin D 1,25(OH)₂D. 1,25(OH)₂D stimulates intestinal calcium absorption. Without vitamin D, only 10–15% of dietary calcium and about 60% of phosphorus are absorbed. Vitamin D sufficiency enhances calcium and phosphorus absorption by 30–40% and 80%, respectively.⁷⁻⁹ Hence; under the light of above mentioned data, the present study was undertaken for assessing the association of serum vitamin D level with severity grading in COVID 19 RT-PCR positive patients.

MATERIALS & METHODS

The present study was undertaken for assessing the association of serum vitamin D level with severity grading in COVID 19 RT-PCR positive patients. 50 Patients diagnosed to have COVID 19 infection

above age of 18 years admitted in COVID positive ward and COVID positive ICU were enrolled. Complete demographic and clinical details of all the patients were recorded.

Inclusion criteria:

- Patients who were COVID 19 RT- PCR positive
- Patients who provided a written informed consent
- Age >18 years

Exclusion criteria:

- Patients with presence of any other co-morbid condition
- Patients already on vitamin D therapy

Serum vitamin D levels were assessed using auto-analyser and were correlated with severity of COVID-19. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

RESULTS

Majority of the patients belonged to the age group of 51 to 70 years. Mean age of the patients was 54.3 years. 64 percent of the patients were males while the remaining 36 percent were females. Dyspnoea was seen in 66 percent of the patients while fever and cough was seen in 60 percent and 64 percent of the patients respectively. Myalgia was seen in 42 percent of the patients. Mean WBC count was 6.86 (x1000) while mean Hb concentration was 13.15 g/dL. Mean CRP levels was 3.92 mg/dL. According to severity, grading, 6 percent and 28 percent of the patients were of mild and moderate grade while 32 percent and 34 percent of the patients were of severe grade and critically ill respectively. Mean serum vitamin D levels among patients with mild, moderate, severe and critically ill COVID-19 was 33.4 ng/mL, 28.2 ng/mL, 23.2 ng/mL and 19.5 ng/mL respectively. Significant results were obtained while comparing mean serum Vitamin D levels among different severity of COVID-19.

Table 1: ICMR Grading of COVID-19 according to severity

Severity grading of COVID- 19	Number of patients	Percentage
Mild	3	6
Moderate	14	28
Severe	16	32
Critically-ill	17	34

Table 2: Comparison of serum Vitamin D levels among different severity of COVID-19

Severity grading of COVID- 19	Serum vitamin D levels		p- value
	Mean	SD	
Mild	33.4	4.2	0.000 (Significant)
Moderate	28.2	6.3	
Severe	23.2	6.8	
Critically-ill	19.5	6.1	

DISCUSSION

The rapid spread of COVID-19 has identified as a public health emergency of international concern. The complete clinical picture of COVID-19 is not fully known but is associated with significant respiratory symptoms and in some cases induces the acute respiratory distress syndrome (ARDS) with multiple organ failure especially in elder patients with history of being treated for chronic disorders. It has been suggested that vitamin D has a protective effect against COVID-19. Vitamin D has been shown to have immunomodulatory activity. Vitamin D [1,25-dihydroxyvitamin D; 1,25(OH)₂D], interacting with its receptor (VDR) in immune cells, modulates the innate and acquired immune systems in response to invasion of bacterial and viral pathogens. It also acts as a modulator of renin-angiotensin pathway and down-regulates ACE-2. Therefore, vitamin D might help in treatment of COVID-19 by preventing the cytokine storm and subsequent ARDS which is commonly the cause of mortality.⁸⁻¹⁰ Hence; under the light of above mentioned data, the present study was undertaken for assessing the association of serum vitamin D level with severity grading in COVID 19 RT-PCR positive patients.

Majority of the patients belonged to the age group of 51 to 70 years. Mean age of the patients was 54.3 years. 64 percent of the patients were males while the remaining 36 percent were females. Dyspnoea was seen in 66 percent of the patients while fever and cough was seen in 60 percent and 64 percent of the patients respectively. Myalgia was seen in 42 percent of the patients. Mean WBC count was 6.86 (x1000) while mean Hb concentration was 13.15 g/dL. Mean CRP levels was 3.92 mg/dL. According to

severity, grading, 6 percent and 28 percent of the patients were of mild and moderate grade while 32 percent and 34 percent of the patients were of severe grade and critically ill respectively. In a previous study conducted by Campi I et al, authors assessed if 25-hydroxyvitamin-D (25OHD) levels are associated with interleukin 6 (IL-6) levels and with disease severity and mortality in COVID-19. 25OHD levels inversely correlated with: i) IL-6 levels; ii) the subsequent need of the ICU admission [relative risk, RR 0.99, 95% confidence interval regardless of age, gender, presence of at least 1 comorbidity among obesity, diabetes, arterial hypertension, creatinine, IL-6 and lactate dehydrogenase levels, neutrophil cells, lymphocytes and platelets count; iii) mortality regardless of age, gender, presence of diabetes, IL-6 and C-reactive protein and lactate dehydrogenase levels, neutrophil cells, lymphocytes and platelets count. In their COVID-19 patients, low 25OHD levels were inversely correlated with high IL-6 levels and were independent predictors of COVID-19 severity and mortality.¹⁰ In the present study, mean serum vitamin D levels among patients with mild, moderate, severe and critically ill COVID-19 was 33.4 ng/mL, 28.2 ng/mL, 23.2 ng/mL and 19.5 ng/mL respectively. Significant results were obtained while comparing mean serum Vitamin D levels among different severity of COVID-19. Butler-Laporte G et al in 2021 assessed evidence supporting a causal effect of circulating 25OHD levels on COVID-19 susceptibility and severity. Their results do not apply to individuals with vitamin D deficiency. In their 2-sample MR study, they did not observe evidence to support an association between 25OHD levels and COVID-19 susceptibility, severity, or hospitalization. Hence, vitamin D supplementation as a means of protecting against worsened COVID-19 outcomes is not supported by genetic evidence.¹¹ Demir M et al examined the relationship between polymerase chain reaction (PCR) test positivity and clinical outcomes of vitamin D levels measured within the 6 months before the PCR test in coronavirus disease 2019 (COVID-19)-positive patients. COVID-19 (227) and non-COVID-19 patients (260) were divided into four groups according to their vitamin D levels: Group I (0-10 ng/ml), Group II (10-20 ng/ml), Group III (20-30 ng/ml), and Group IV (vitamin D > 30 ng/ml). Elevated vitamin D levels could decrease COVID-19 PCR positivity, D-dimer and CRP levels and the number of affected lung segments in COVID-19-positive patients, thereby shortening the duration of hospital stays and alleviating the intensity of COVID-19.¹²

CONCLUSION

The overlap in the vitamin D associated biological pathways with the dysregulation reported to drive COVID-19 outcomes warrants further investigation, as does the role that vitamin D levels at time of presentation of COVID-19 may have as predictive biomarkers of disease severity.

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