ORIGINAL ARTICLE

Frequency of Severe Vitamin D Deficiency and its Association with Mortality in Patients with Corona virus Disease

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ABSTRACT

Aim: To determine the frequency of severe vitamin D deficiency and its association with mortality in patients presented with Covid-19.

Study Design: Cross-sectional/Observational

Place and Duration of Study: Chandka Medical College Hospital, Larkana and Gambat Medical College Hospital, Gambat from 1st March 2020 to 31st August 2020

Methodology: One hundred and twenty five patients of both genders diagnosed to have severe covid-19 disease by real time PCR were analyzed. Patient's ages were ranging from 15 years to 70 years. Detailed demographics were recorded after taking written consent. 5 ml blood sample was taken from all the patients to examine the vitamin D level. Severe Vitamin D deficiency was defined as 25(OH)D <25 nmol/L (10 ng/dL). Association between mortality and severe vitamin D deficiency was examined.

Results: Seventy five (60%) were males while 50 (40%) were females with mean age 45.58±15.66 years. Severe vitamin D deficiency was observed in 57 (45.6%) patients. Overall mortality was found in 14 (11.2%) patients, Among 57 patients with severe vitamin D deficiency 12 (9.6%) were died while patients with no vitamin D deficiency 2/68 (1.6%), a significant association was observed between severe vitamin D deficiency and mortality in patients with covid-19 disease with p-value <0.05.

Conclusion: There was strong relationship between severe vitamin-D deficiency and mortality in patients with covid-19 disease.

Keywords: Covid-19, Vitamin D Deficiency, Mortality

INTRODUCTION

Coronavirus disease 2019 (COVID-19), which is caused by serious acute respiratory syndrome 2 (SARS-CoV-2) and has also caused more than 745 000 deaths worldwide, is often extreme lower respiratory symptoms.[1] The lack of evidence to show successful pharmacology strategies in order to avoid COVID-19 is a challenge to stop this pandemic. Treatment with vitamin D was described as a possible COVID 19 preventive or treatment strategy.[2] Other viral respiratory infections, particularly in people with deficiency in vitamin D, were found to decrease in vitamin D treatment.[3] Vitamin D deficiency among persons with darker skin or sun-residues, including those living in higher latitudes in the winter, nursing homes and health care workers[4], is widespread in almost half of the US population. COVID-19 has become more prevalent among people living in African American states[5], in the late winter, in north towns[6] old adults[7], nurses and medical staff, populations all of which are at elevated risk of vitamin D deficiency.[8]

As the main target cells, the virus infects pneumocytes of type II and enterocytes.[9] Spike viral proteins promote viral entry into target cells by linking to enzyme-converting angiotensin 2 (ACE-2) on cell surface.[10] ACE 2 is a reinforced renin-angiotensin system regulating organism in a wide variety of body tissues that may explain multi-organ failure in susceptible patients, including lung, kidney, gastrointestinal (GI) and cardiovascular systems.[11]

Vitamin D has been proposed to defend against COVID-19. Immunomodulatory activity in vitamin D has been shown. Vitamin D, interacting in immune cells with the vitamins' receptor (VDR), modulates the immune systems that are born and acquires in response to bacterial and viral invasions, which is the product of an immune mechanism that is intrinsic in the immune system.[12] It also functions as a renin-angiotensin modulator and ACE-2 down-regulators.[13] Vitamin D therefore can help prevent cytokine storm and subsequent ARDS, commonly the causes of death, in the treatment of COVID-19.[14]

We conducted present study to find out the association between severe vitamin D deficiency and mortality in patients diagnosed to have severe Covid-19 disease.

MATERIALS AND METHODS

This prospective/observational study was conducted at Chandka Medical College Hospital, Larkana and Gambat Medical College Hospital, Gambat from 1st March 2020 to 31st August 2020. A total of 125 patients of both genders diagnosed to have severe covid-19 were enrolled in this study. Patient's ages were ranging from 15 years to 70 years. Detailed demographics including age, sex, and body mass index (BMI) were recorded after taking written consent. Patients on vitamin D supplementation and those with no consent were excluded. Real time PCR was done to all the patients to diagnose covid-19 disease. 5 ml blood

sample was taken from all the patients to examine the vitamin D level. Severe Vitamin D deficiency was defined as 25(OH)D <25 nmol/L (10 ng/dL). Association between mortality and severe vitamin D deficiency was examined. All the data was analyzed by SPSS 24.0. Chi-square test was done to examine the association between severe vitamin D deficiency and mortality. P-value <0.05 was taken as significant.

RESULTS

There were 75 (60%) males while 50 (40%) were females with mean age 45.58±15.66 years. Mean BMI of patients was 24.53±3.27 kg/m^2 (Table 1). Fifty seven (45.6%) patients had vitamin D level <25 nmol/L and 68 (54.4%) patients had vitamin D level >25 nmol/L (Fig. 1).

Overall mortality was found in 14 (11.2%) patients, Among 57 patients with severe vitamin D deficiency 12 (9.6%) were died while patients with no vitamin D deficiency 2/68 (1.6%), a significant association was observed between severe vitamin D deficiency and mortality in patients with covid-19 disease with p-value <0.05 (Table 2).

Table 1: Demographics of all the patients

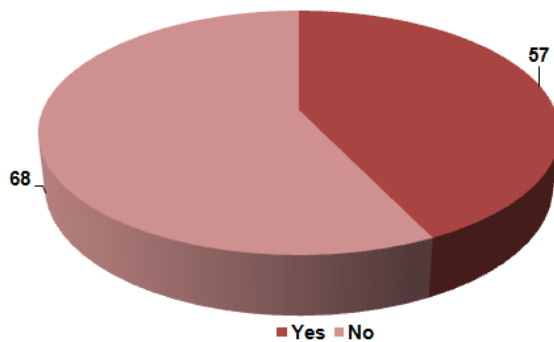| Variable	No.	%
Age (years)	45.58±15.66	
Body mass index (kg/m^2)	24.53±3.27	
Gender		
Male	75	60.0
Female	50	40.0

Fig. 1: Frequency of severe vitamin D deficiency

Table 2: Association between mortality and severe vitamin D deficiency

Mortality	Severe vitamin D deficiency		P value
	Yes (n=57)	No (n=68)	
Yes	12 (21.05%)	2 (2.94%)	0.024
No	45 (78.95%)	66 (97.06%)	

DISCUSSION

In December 2019 in Wuhan, China, the first case of corona virus was found and this life-threatening disease spread rapidly around the world. More than three hundred thousand people in Pakistan have been affected by corona virus and over six thousand deaths have already been registered.[15] Pakistan is one country where the spread of corona-virus is too high and because of uneasy human behaviour and the SOPs for life-threatening diseases are not followed. A worldwide epidemic, not only in the North,

but increasingly also in the South, is the vitamin D deficiency. For instance, whereas in Europe, deficits in all age groups (<30 nmol) range from 20% to 60%, in Asia childhood figures range to 61% (Pakistan, India) and 86% (Iran).[16,17] Studies demonstrated that patients with history of severe vitamin D deficiency were on high risk to develop coronavirus disease.[18] We conducted present study to examine the association between severe vitamin D deficiency and mortality among patients with severe covid-19 disease. In this regard 125 patients were enrolled. Majority 60% patients were males and maximum number of patients was ages between 30 years to 50 years. These results showed similarity to many of previous studies in which male patients were predominant 60% and majority of patients were ages above 40 years.[18,19]

In present study severe vitamin D deficiency was found in 57 (45.6%) patients while 68 (54.4%) patients had vitamin D level >25 nmol/L. A study conducted in Iran by Maghbooli et al[20] reported that severe covid-19 was found in 74% patients and among them severe vitamin D deficiency was observed in 32.8% patients. Another study by Carpagnano et al[21] reported that out of 42 covid-19 patients, severe vitamin D deficiency was found in 81% patients.

In our study, mortality was found in 14 (11.2%) patients, Among 57 patients with severe vitamin D deficiency 12 (9.6%) were died while patients with no vitamin D deficiency 2/68 (1.6%), a significant association was observed between severe vitamin D deficiency and mortality in patients with covid-19 disease with p-value <0.024. A study by Baktash et al[22] demonstrated that severe vitamin D deficiency had a significant association with adverse outcomes in patients with covid-19 disease.

D'Avolio and colleagues[23] provide evidence of a correlation between the vitamin D deficiency and the adverse COVID-19 outcome. For patients with Vitamin D deficiency the earlier study (pre-print) showed that the disease incidence is increased and for patients with COVID-19 positive and negative vitamin D serum concentration has decreased.

In order to research vitamin D interaction and COVID-19 morbidity and mortality in twenty European countries, Ilie and colleagues[24] carried out a meta-analysis and suggested possible associations between vitamin D levels, SARS-CoV-2 infections, and mortality. Hastie et al[25] have used data from 449 biobank persons with reported SARS-CoV-2-infections and have found no correlation to serum levels of 25(OH)D.

CONCLUSION

Vitamin D plays an important role in the prevention of any severe illness. We concluded that severe vitamin D deficiency was found in 45.6% patients. Also vitamin D deficiency had a strong association between with increase rate of mortality. Patients with severe Vitamin D deficiency had high rate of mortality as compared to patients with vitamin D level >25 nmol/L.

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