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EVALUATION OF SUNSHINE VITAMIN(VITAMIN-D) IN COVID-19 PATIENTS

Biochemistry

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ABSTRACT

Background: The world was in the grip of the COVID 19 pandemic. The role of Vitamin D is important for the function of the immune system and vitamin D supplements have previously been shown to lower risk of viral respiratory tract infections. **Objectives:** To assess Vitamin D status in COVID-19 patients. Materials and methods: In this cross sectional study 120cases were recruited.Vitamin D, Calcium, Phosphorous, ALP, Uric acid, and Magnesium were estimated. Appropriate statistical analysis was done. P value of <0.05 was taken as significant. **Results:** The mean Vitamin D (39.46±24.59 v/s 65.5±20 ng/ml) and calcium (8.85±0.61 v/s 9.4±0.4mg/dL) in cases were significantly low compared to controls (p<0.05). The mean Alkaline Phosphatase values are (86.8±29.72 v/s 65±17.5 IU/L) significantly higher in cases as compared to controls. Phosphorous, Uric acid and Magnesium levels showed no statistical difference when compared to controls. **Conclusion:** Our study has shown that Vitamin D levels are low in covid-19 cases. These findings are consistent with Xu et al[14] who have shown that vitamin D is required for normal immune function for fighting pathogens. Therefore it is recommended to give vitamin D supplementation in all covid cases.

KEYWORDS

INTRODUCTION:

Coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), often produces severe lower respiratory symptoms and has caused more than 745000 deaths worldwide.[1] One challenge in halting this pandemic is the absence of evidence demonstrating effective pharmacologic interventions to prevent COVID-19. Vitamin D treatment has been identified as a potential strategy to prevent or treat COVID-19.[2] Vitamin D treatment has been found to decrease other viral respiratory infections, especially in persons with vitamin D deficiency.[3]

Vitamin D deficiency is a global health problem.[4] It has been recognized to be involved in various immune functions as well as bone and muscle development.[5] The reason for this almost ubiquitous role of Vitamin D is perhaps because Vitamin D receptor (VDR) is virtually expressed in every tissue and organ system of the body.[6] Vitamin D mediates its effect though VDR and activation of VDR-responsive genes.

Vitamin D has been classically linked to calcium absorption and bone health. However, over the last decade, the key role of vitamin D in inflammation and immunoregulation has been increasingly recognised. Vitamin D exerts its effects by binding to a nuclear vitamin D receptor (VDR), which is expressed in various immune cells, with particularly high levels in dendritic cells (antigen-presenting cells), macrophages, and T (e.g., $CD4^+$ and $CD8^+$) and B lymphocytes [7,8]. As a steroid hormone, vitamin D is able to cross lipid membranes, and interact directly with its nuclear receptor. This binding action leads to transcriptional regulation of target genes, including those coding for inflammatory mediators and proteins required to alter phenotypes of immune cells [9]. However, the immunomodulatory effects of vitamin D signalling are determined by phenotypes of the target immune cells. For example, naïve T cells express VDRs in basal concentrations, but this is increased dramatically upon activation [10,11]. In monocytes, however, differentiated monocytes express fewer VDRs [12]. Vitamin D is also involved in several signalling pathways that are activated in a non-genomic manner by calcitriol [13].

Review Of Literature:-

Drishti Ghelani et al in recent studies said that current evidence supports the links between vitamin D and COVID-19 and the benefits of vitamin D supplementation for managing or treating this condition. Whittermore et al in their correlation analysis of data said that Countries closer to the equator had lower COVID-19 fatalities than countries further away; 16% of this effect was attributed to latitude.

Baktash et al in their cohort study observed Vitamin D deficiency was associated with needing more care, and with the occurrence of cytokine storms.

David O Meltzer et al showed the first assessment of association of vitamin D deficiency and potentially insufficient treatment with testing positive for COVID-19.

Xu et al showed that vitamin D is required for normal immune function for fighting pathogens.

AIMS AND OBJECTIVES:

A. To evaluate Vitamin D status in COVID-19 patients.
B. To correlate Calcium, Phosphorous, ALP, Uric acid, and Magnesium with Vitamin D in COVID-19 patients.

Participant Recruitment Procedures:

Inclusion Criteria:

New cases of COVID-19 between 18- 70 years of age who had been admitted in NIMS from September 2020 to December 2020.

Exclusion Criteria:

- History of other diseases like malignancy, inflammatory diseases, kidney diseases will be excluded from the study.
- Patients who have previously attended OPD in Nizam's Institute of Medical Sciences and had their blood tested for vitamin D levels.

MATERIALS AND METHODS:

Sample Size:

120 subjects and 100 healthy controls were included of approximate age. Sample size is collected based on the previous study of Martineau AR et al [3] with an adjusted odds ratio (aOR) 0.88,95% confidence interval (CI) 0.81 to 0.96; heterogeneity $p < 0.001$

Type Of Study Design:

Retrospective, single centre study

Investigative Site:

Departments of Biochemistry, Nizam's Institute of Medical Sciences (NIMS), Punjagutta, Hyderabad

Subject Selection:

- Study subjects were selected who were admitted in Nizam's Institute of Medical Sciences and had their blood tested for thyroid profile and vitamin D levels for the first time between September 2020 and December 2020.
- Data of the subjects was collected from electronic medical records.
- Electronic consent was sent out to respective patients and history

of previous intake of Vitamin D supplements and comorbidities has been collected.

Laboratory Testing

- Laboratory data on Vitamin D, Calcium, Phosphorous, ALP, UA, Mg is collected.

Tests

Methodology

Vitamin D :- CLIA
Calcium
Phosphorous
Alkaline Phosphatase
Uric acid
Magnesium
— Colorimetry

Statistical Analysis:

The statistical analysis was done by Microsoft Excel and Graph pad Prism. Normality for all the variables in controls and cases was checked using Kolmogorov Smirnov test. The data is expressed as mean ± SD when it is parametric. $p < 0.05$ is considered as significant. For normally distributed parameters Pearson correlation was measured.

RESULTS:

The mean Vitamin D (39.46±24.59 v/s 65.5±20 ng/ml) and Calcium (8.85±0.61 v/s 9.4±0.4mg/dL) in cases were significantly low compared to controls ($p<0.05$). The mean Alkaline Phosphatase values are (86.8±29.72 v/s 65±17.5 IU/L) significantly higher in cases as compared to controls. Phosphorous, Uric acid and Magnesium levels showed no statistical difference when compared to controls. Pearson correlation is significant between Vitamin D and Calcium.

DISCUSSION:

Infections of the respiratory tract are more frequent in the winter months and especially in the northern latitudes than they are in summer [15]. This obviously also applies to the COVID-19 infectious disease that briefly spread all over the world in the winter months and became a pandemic. Vitamin D plays an essential role in the immune system [16]. Vitamin D interferes with the majority of the immune systems cells such as macrophages, B and T lymphocytes, neutrophils and dendritic cells, which express VDR. Cathelicidin, a peptide formed by vitamin D stimulated expression, has shown antimicrobial activity against bacteria, fungi and enveloped viruses, such as corona viruses. Furthermore Vitamin D inhibits the production of pro-inflammatory cytokines and increases the production of anti-inflammatory cytokines. As there is an association of Vitamin D with the immune system,its supplementation has been found to be effective in COVID-19 patients.

CONCLUSION:

Our study has shown that Vitamin D levels are low in covid-19 cases. These findings are consistent with Xu et al who have shown that vitamin D is required for normal immune function for fighting pathogens. Immune cells have been known to express Vitamin D receptors (VDR) and various immune cells are capable of converting 25-hydroxy Vitamin D (25OHD) into active form 1,25-$(OH)_2$ D. This facilitates local regulation of the 1,25-$(OH)_2$ D at the site of inflammation. Thus depicting the role of Vitamin D as anti-inflammation in COVID 19 patients. The hypocalcemia is associated with vitamin D deficiency.Increase in ALP and abnormalities in LFT may be due to Remdesivir, Favipiravir. Therefore it is recommended to give vitamin D supplementation in all covid cases.

Table 1 Baseline characteristics of study group

Variables	Cases(n=50)
Males	76(63.3%)
Females	44(36.7%)
Hypertension	78 (65%)
Diabetes mellitus	69(58%)
Smoking	48(40%)

Table 2 Variables in Cases and Controls

Variable	Cases(n=120)	Controls(n=100)	p-Value
Vitamin D(ng/ml)	39.46±31.15	60±20	<0.05
Calcium(mg/dL)	8.85±0.61	9.4±0.4	<0.05
Phosphorous(mg/dL)	3.38±0.82	3.5±0.5	0.0809
Alkaline Phosphatase(IU/L)	86.88±29.72	65±17.5	<0.05
Uric acid(mg/dL)	5.07±1.87	5.35±0.92	0.0464
Magnesium(mg/dl)	0.83±0.01	0.85±0.12	0.2724

Table 3 Pearson Correlation between variables

Variable	Vitamin D	Calcium	Alkaline Phosphatase
Vitamin D(ng/ml)		<0.05	0.0453
Calcium(mg/dL)	<0.05		0.2435
Alkaline Phosphatase (IU/L)	0.8015	0.0125	

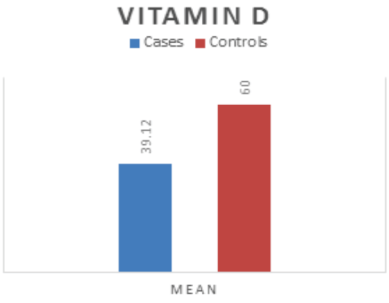

Figure 1 Mean values of Vitamin D in cases and controls

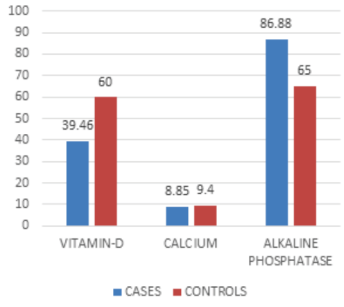

Figure 2 Mean values of Variables in cases and controls

REFERENCES

1. COVID-19 corona virus pandemic. Worldometer. Updated August 12, 2020. Accessed August 12, 2020. https:// www.worldometers.info/coronavirus
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. doi:10.3390/nu12040988
3. 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:i6583. doi:10.1136/ bmj.i6583
4. Hollick MF, Chen TC. Vitamin D deficiency a worldwide problem with health consequences.Am J Clin Nutr.2008; 87:10805–68.
5. Deluca HF. Evolution of our understanding of vitamin D. Nutr Rev. 2008; 66(10): 73–87.
6. Caprio M, Infante M, Calanchini M, Mammi C, Fabbri A. Vitamin D: Not just the bone. Evidence for beneficial pleiotropic extraskeletal effects. Eat Weight Disord 2017; 22:27-41.
7. Gysemans C.A., Cardozo A.K., Callewaert H., Giulietti A., Hulshagen L., Bouillon R., Eizirik D.L., Mathieu C.1,25-Dihydroxyvitamin D3 modulates expression of chemokines and cytokines in pancreatic islets: Implications for prevention of diabetes in nonobese diabetic mice. *Endocrinology.* 2005;146:1956–1964. doi: 10.1210/en.2004-1322.
8. Takahashi K., Nakayama Y., Horiuchi H., Ohta T., Komoriya K., Ohmori H., Kamimura T. Human neutrophils express messenger RNA of vitamin D receptor and respond to 1 α, 25-dihydroxyvitamin D3. *Immunopharmacol. Immunotoxicol.* 2002;24:335–347. doi: 10.1081/IPH-120014721.
9. Warwick T., Schulz M.H., Günther S., Gilsbach R., Neme A., Carlberg C., Brandes R.P., Seuter S. A hierarchical regulatory network analysis of the vitamin D induced transcriptome reveals novel regulators and complete VDR dependency in monocytes. *Sci. Rep.* 2021;11:6518. doi: 10.1038/s41598-021-86032-5.
10. Baeke F., Korf H., Overbergh L., van Etten E., Verstuyf A., Gysemans C., Mathieu C. Human T lymphocytes are direct targets of 1, 25-dihydroxyvitamin D3 in the immune system. *J. Steroid Biochem. Mol. Biol.* 2010;121:221–227. doi: 10.1016/j.jsbmb.2010.03.037.
11. Provvedini D.M., Tsoukas C.D., Deftos L.J., Manolagas S.C. 1, 25-dihydroxyvitamin D3 receptors in human leukocytes. *Science.* 1983;221:1181–1183. doi: 10.1126/science.6310748.
12. Hewison M., Freeman L., Hughes S.V., Evans K.N., Bland R., Eliopoulos A.G., Kilby M.D., Moss P.A., Chakraverty R. Differential regulation of vitamin D receptor and its ligand in human monocyte-derived dendritic cells. *J. Immunol.* 2003;170:5382–5390. doi: 10.4049/jimmunol.170.11.5382.
13. Qayyum S., Mohammad T., Slominski R.M., Hassan M.I., Tuckey R.C., Raman C., Slominski A.T. Vitamin D and lumisterol novel metabolites can inhibit Sars-cov-2 replication machinery enzymes. *Am. J. Physiol. Endocrinol. Metab.* 2021;321:E246–E251. doi: 10.1152/ajpendo.00174.2021.
14. The importance of vitamin d metabolism as a potential prophylactic, immunoregulatory and neuroprotective treatment for COVID-19 Yi Xu 1 2 3, David J Baylink 4, et al PMID: 32847594,PMCID: PMC7447609DOI: 10.1186/s12967-020-02488-5
15. Arya V, Bhambri R, Godbole M M, Mithal A. Vitamin D status and its relationship with bone mineral density in healthy Asian Indians. Osteoporos. Int, 2004;15:56-61. Baeke F, Taikiishi T.
16. Prietl B., Treiber G., Piber T.R., Amrein K. Vitamin D and immune function. *Nutrients.* 2013;5:2502–2521