



**ASSOCIATION OF VITAMIN D DEFICIENCY IN CHRONIC OBSTRUCTIVE
PULMONARY DISEASE AND ITS SEVERITY**

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ABSTRACT

Background: Vitamin D deficiency is wide spread in India. Vitamin D has role in immunity and is capable of decreasing pulmonary inflammatory response. Thus Vitamin D also has a role in Chronic Obstructive Pulmonary disease. Many studies have shown that Vitamin D deficiency in COPD is associated with increased severity and low FEV1. In this study, we tried to find a co-relation between Vitamin D deficiency and COPD severity.

Methods: This is a cross-sectional performed over a period of 1 year. 230 COPD patients in the out-patient department were included in the study. Patients with other co-morbidities like hypertension, diabetes mellitus, chronic kidney disease, liver disease etc. were excluded from the study. Serum Vitamin D levels were measured in all the patients. Spirometry and Pulmonary Function Tests were conducted in all the patients. **Results:** Among 230 patients, 202 patients were males and 18 patients were females. All patients were aged between 40 and 70 years. Mean BMI of the study population was 27.40 ±4.91 kg/m². The study population was distributed in 4 groups based on the GOLD criteria. 30.43% patients were in GOLD criteria 1. 39.56% patients were in GOLD criteria 2. 20.86% patients were in GOLD criteria 3. 9.13% patients were in GOLD criteria 4. **Conclusion:** In this study, we concluded that Vitamin D deficiency is present in COPD patients. There is a positive co-relation between serum Vitamin D levels and level of severity of COPD.

INTRODUCTION

Vitamin D deficiency is very common in Asian continent. In India, the prevalence of Vitamin D is very high. The prevalence is as high as 70% in some parts of India. This is because of lack of fortification of dairy food with Vitamin D. Vitamin D deficiency is further classified into Vitamin D deficiency as <30ng/ml and severe deficiency as <10ng/dl. Vitamin D is important not only for prevention of rickets but also for diabetes mellitus, hypertension and a few cancers in adults.^[1] A few research studies have also shown a role of Vitamin D in infections, cardiovascular diseases, cancer and autoimmune diseases.^[2,3] Vitamin D also has role in many respiratory diseases like cystic fibrosis, COPD, Bronchial asthma and respiratory infections. NHANES III study conducted in USA showed that higher serum levels of Vitamin D are associated with better lung function as measured by FEV1. The exact mechanism for connection between Vitamin D and lung function is not found. It is believed to be due to its effect on regulating inflammation, inducing antimicrobial function

and its action on respiratory muscles. One study conducted has shown that high level of Vitamin D intake is associated with better lung functions not only in adults but also adolescents.^[4] A number of studies in recent times have shown a co-relation between Vitamin D deficiency and COPD severity. Many studies have measured by a reduction in FEV1.^[5,6] Vitamin D deficiency is an easily treatable condition and hence we tried to find a co-relation between Vitamin D deficiency and COPD severity in Indian population.

METHODS

This is a cross-sectional study. Inclusion criteria were age 35 years or more with history suggestive of COPD and spirometry confirmed diagnosis of COPD as per GOLD criteria (post-bronchodilator FEV1/FVC <70%) were included. Exclusion criteria were TB, HIV, HTN, Diabetes, Asthma, Ischemic heart disease, Chronic Kidney Disease, cancer or oral glucocorticoid therapy. A total of 230 patients were recruited in the study as per our inclusion and exclusion criteria. Detailed history was

taken from all the participants. Physical examination of all the participants was done properly. Complete blood count, Serum Vitamin D levels, renal function tests, liver function tests, chest x ray and other investigations were done as per the patient requirement. For data analysis, we used SPSS software. Mean \pm SD for the data with normal distribution was obtained. The differences between the two groups were calculated as two sided paired t-test. To analyse the relationships between variables, student T test and simple regression were performed. A p value of <0.05 was considered as statistically significant.

RESULTS

The baseline characteristics of the study population are shown in table 1. The average age of the study population is 40.56 ± 6.78 years. There were 202 males and 18 females in the study population. The male ratio is thus 87%. The average BMI of the study population is 26.47 ± 5.42 kg/m². There were 182 patients who were active smokers or had a past history of smoking (79.13%).

Table 1: Baseline characteristics of the study population.

	COPD
Age	40.56 \pm 6.78
Sex (Male)	202(87%)
BMI	26.47 \pm 5.42
Smoking	182(79.13%)

All the patients were distributed on the basis of the GOLD criteria. This is shown in table 2. There were 70 patients in the GOLD criteria 1(30.43%). 91 patients in the GOLD criteria 2(39.56%). 48 patients in the GOLD criteria 3(20.86%). 21 patients in GOLD criteria 4(9.13%).

Table 2: GOLD distribution of COPD stages.

GOLD stage	Frequency	Percentage
GOLD 1	70	30.43%
GOLD 2	91	39.56%
GOLD 3	48	20.86%
GOLD 4	21	9.13%

Vitamin D status was divided into 3 categories which is depicted in table 3. >30 ng/ml was considered sufficient serum level. There were 73 patients(31.73%) in this group. >10 to <30 ng/ml was considered as deficiency. There were 104 patients(45.21%) in this deficiency category. Severe deficiency was defined as <10 ng/ml and there were 53 patients(23.04%) patients in this category.

Table 3: Serum Vitamin D status of study population.

Vitamin D status	Frequency	Percentage
Sufficient(>30 ng/ml)	73	31.73%
Deficiency(>10 to <30 ng/ml)	104	45.21%
Severe Deficiency (<10 ng/ml)	53	23.04%
Total	230	

Serum Vitamin D deficiency status in various COPD stages is shown in table 4. In GOLD criteria 1, out of 70 patients, 38(54.28%) patients had sufficient levels of Vitamin D and 32(45.71%) patients had Vitamin D deficiency or severe deficiency. In GOLD criteria 2, out of 91 patients, 28(30.76%) patients had sufficient levels of Vitamin D and 63(69.23%) patients had deficient levels of Vitamin D. In GOLD criteria 3, out of 48 patients, 5(10.41%) patients had sufficient levels of Vitamin D and 43(89.53%) patients had deficient levels of Vitamin D. In GOLD criteria 4, there were 2(9.52%) patients who had sufficient levels of Vitamin D and 19(90.47%) patients who had deficiency levels of Vitamin D.

As the severity of COPD increases which is depicted by GOLD criteria, the deficiency of vitamin D increases. The p value calculated in our study was 0.02 which is less than 0.05 showing that the observation is statistically significant.

Table 4: Serum Vitamin D deficiency status in various COPD stages.

COPD stage	Sufficient	Deficient(Deficiency +severe deficiency)
GOLD 1 (70)	38(54.28%)	32(45.71%)
GOLD 2 (91)	28(30.76%)	63(69.23%)
GOLD 3 (48)	5(10.41%)	43(89.53%)
GOLD 4 (21)	2(9.52%)	19(90.47%)

DISCUSSION

This study was conducted in a single institute and 230 COPD patients were taken in this study. The age of the patients ranged from 37 to 84 years. Most of the study population was above the age of 50(70%). 202(87%) patients were male and 18(13%) patients were females. Most of the study population was in GOLD criteria 1(30.43%) or GOLD criteria 2(39.56%) and 29% of the study population was in GOLD criteria 3 or GOLD criteria 4. The average BMI of the study population was 26.47 ± 5.42 . Maximum BMI of the participants was 34.56kg/m² and most of the patients had a normal BMI between 18.5-25kg/m². 16 patients were obese with BMI >30 kg/m². Minimum level of serum Vitamin D level was 6.7ng/ml.

Zhang P et al conducted a study in stable COPD patients and found out that prevalence of Vitamin D deficiency was significantly higher in the COPD patients (39.47%) when compared to the control group (7). The study by Gouda et al showed that 56.7% of patients with COPD had mild to moderate degree of Vitamin D deficiency and 43.3% of patients with COPD had severe deficiency (8). 62% of COPD patients in the study of Tedd H et al showed low levels of Vitamin D (9). Our study showed that severity of Vitamin D deficiency in stable COPD patients increases as the disease severity increases. Prevalence of Vitamin D deficiency in GOLD criteria 1 patients were 45.71%, 69.23% in GOLD criteria 2 patients, 20.86% in GOLD criteria 3 patients, 9.13% in GOLD criteria 4 patients. Compared to other studies, our study had a higher deficiency of Vitamin D.

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CONCLUSION

In this study, we concluded that Vitamin D deficiency is present in COPD patients. There is a positive co-relation between serum Vitamin D levels and level of severity of COPD.

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