

**Association between vitamin D deficiency and diminished pulmonary functions****Abhishek Kumar<sup>1</sup>, Ravi Shankar Mishra<sup>2\*</sup>, Piyush khajuria<sup>3</sup>**<sup>1</sup>Assistant Professor, Department of Pulmonary Medicine, TMMC&RC, Moradabad, Uttar Pradesh, India<sup>2</sup>Assistant Professor, Department of Pulmonary Medicine, L.N.Medical College& J.K hospital, Bhopal, M.P., India<sup>3</sup>Assistant Professor, Department of Medicine, TMMC&RC, Moradabad (U.P)

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**Abstract**

**Introduction:** Chronic Obstructive Pulmonary Disease (COPD) is a chronic disease that causes persistent airflow obstruction. Vitamin D Deficiency (VDD) as global health problem was shown to be a modifiable explanatory factor to improve outcomes in several chronic diseases. The precise role of vitamin D in the pathogenesis of COPD is unclear however studies have described that vitamin D can alter the activity of various immune cells, regulate airway smooth muscle and inhibit inflammatory responses. **Material and methods:** The study was conducted in the department of pulmonary medicine. All patients were evaluated with a detailed history and physical examination. Relevant investigations including estimation of vitamin D levels were done in all cases. The diagnosis and staging of COPD was made according to the GOLD criteria by spirometry and bronchodilator testing and patients were classified into moderate, severe and very severe COPD on the basis of their FEV1/FVC ratios. The presence of vitamin D deficiency was defined as 25(OH)D levels < 20.0ng/ml, Vitamin D insufficiency as 25(OH)D levels 20ng/ml- 29ng/ml and Vitamin D sufficiency as 25(OH)D levels >30ng/ml-100ng/ml and toxic >150ng/ml. **Results:** The studied population showed a mean age of 54.71 years with a male 82% and female 18%. A history of smoking was present in 78% of the patients. The most common presenting symptom was dyspnoea in 78% patients followed by fatigue in 63% of the patients. Cough, Fever, and Musculoskeletal pain was present in 44%, 39% and 28% respectively. After Spirometric evaluation and bronchodilator testing 33% of the patients were classified into moderate COPD, 51% were classified as severe COPD and 16% patients were found to have very severe disease. Out of the 180 patients, 46 of them (46%) presented in exacerbation. **Conclusion:** The study concludes that vitamin D deficiency is more prevalent in the patients with COPD and the frequency increases with the severity of the disease. The association between 25(OH) D levels and COPD did not meet the level of statistical significance in the present study. Due to paucity of data further studies with a longer follow up period are recommended.

**Key words:** COPD, Vitamin D, Pulmonary Disease, Exacerbations

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**Introduction**

Chronic Obstructive Pulmonary Disease (COPD) is a chronic disease that causes persistent airflow obstruction. The airflow obstruction in this disease is generally progressive[1]. Chronic obstructive pulmonary disease (COPD) is characterized by airflow limitation that is not fully reversible and which is associated with significant extra pulmonary effects that may contribute to its severity and prognosis in individual patients[2]. Chronic Obstructive Pulmonary Disease(COPD) was known as the third leading cause of death in the world and had resulted in over 3.1 million deaths globally in 2012[3]. In addition, prevalence and burden of COPD is risen over time[4]. Majority of this burden is attributed to hospitalization and disease exacerbations[5]. COPD bears a substantial burden for patients, family, and the health care system[6]. Patients with COPD had significantly worse activities of daily living and physical, social, and emotional functioning than the patients with non-small cell lung cancer[7] and Quality of life is significantly impaired in COPD patients[7-9], even in those with mild airway obstruction[10]. Vitamin D Deficiency (VDD) as global health problem was shown to be a modifiable explanatory factor to improve outcomes in several chronic diseases[11]. The precise role of vitamin D in the pathogenesis of COPD is unclear however studies have described that vitamin D can alter the activity of various immune cells, regulate airway smooth muscle and inhibit inflammatory responses[12-14].

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The dietary intake of vitamin D is also reduced in COPD patients particularly in elderly[15-16]. Patients with certain gene variants of the vitamin D transport protein shows significant correlation between serum levels of vitamin D and severity of COPD. Polymorphisms of the vitamin D binding protein have also been reported to reduce the risk of developing COPD or preventing its exacerbations[17-18]. COPD has two clinical phases (stable phase and exacerbation phase), both of which are associated with inflammation. Smoking, passive smoking, reactivity of airways, occupational factors and air pollution are the risk factors of COPD. Independent risk factors for COPD are male gender, advanced age; low socioeconomic status, occupational exposure and cigarette smoking[19]. There have been some studies to determine whether vitamin D plays a role in some respiratory diseases. An association between vitamin D deficiency and decreased pulmonary functions as well as airflow limitation in asthma patients has been suggested[20].

**Material and methods**

The study was conducted in the department of pulmonary medicine. All patients were evaluated with a detailed history and physical examination. Relevant investigations including estimation of vitamin D levels were done in all cases. The diagnosis and staging of COPD was made according to the GOLD criteria by spirometry and bronchodilator testing and patients were classified into moderate, severe and very severe COPD on the basis of their FEV1/FVC ratios. The presence of vitamin D deficiency was defined as 25(OH)D levels < 20.0ng/ml, Vitamin D insufficiency as 25(OH)D levels 20ng/ml- 29ng/ml and Vitamin D sufficiency as 25(OH)D levels >30ng/ml- 100ng/ml and toxic >150ng/ml.

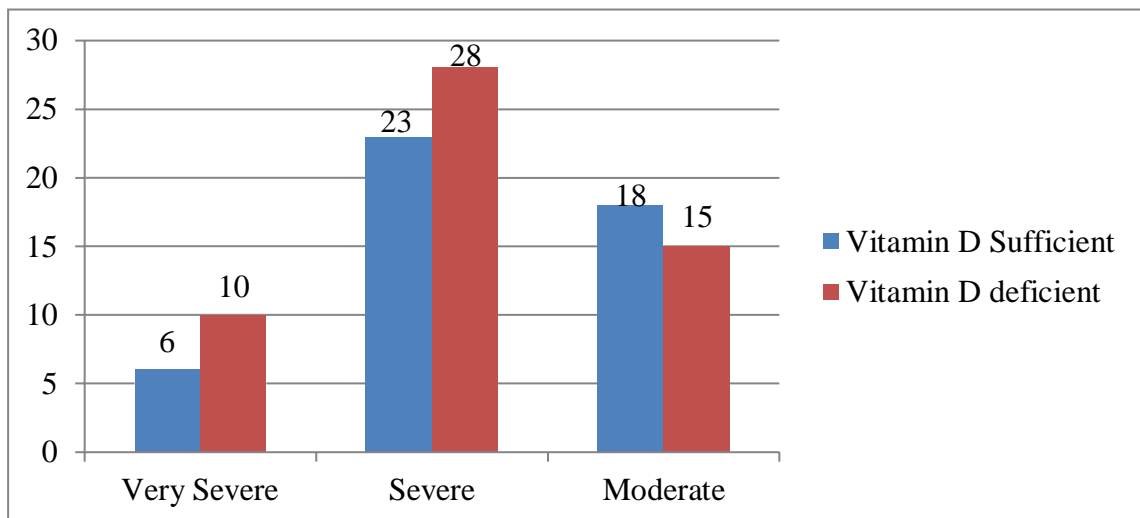
**Results**

The studied population showed a mean age of 54.71 years with a male 82% and female 18%. A history of smoking was present in 78% of the patients. The most common presenting symptom was dyspnoea in 78% patients followed by fatigue in 63% of the patients. Cough, Fever and Musculoskeletal pain was present in 44%, 39% and 28%

respectively. After Spirometric evaluation and bronchodilator testing 33% of the patients were classified into moderate COPD, 51% were classified as severe COPD and 16% patients were found to have very severe disease. Out of the 180 patients, 46 of them (46%) presented in exacerbation.

**Table-1: Baseline characteristics of the study population**

<b>Total number of patients (n)</b>	100
<b>Sex</b>	
Male	82 (82%)
Female	18 (18%)
Age (years)	54.71±12.87
Smoking History	78 (78%)
<b>Presenting Complaints</b>	
Exertional Dyspnoea	78 (78%)
Fatigue	63 (63%)
Cough	44 (44%)
Fever	39(39%)
Musculoskeletal Pain	28 (28%)
<b>COPD Stage</b>	
Moderate	33 (33%)
Severe	51 (51%)
Very Severe	16 (16%)
Exacerbation	46 (46%)



**Figure-1: Table comparing Vitamin D levels with the severity of COPD**

**Discussion**

This study showed that serum concentrations of 25-hydroxy vitamin D cannot be used in the diagnosis of COPD, and that measurements of serum 25(OH)D concentrations prior to spirometry will not play a role in case determination or in screening high-risk subjects with possible COPD. Since COPD is defined by airflow limitation measured using spirometry, two presumptive methods have been reported for targeted case identification to reduce the burden of COPD. One method uses a portable device called a hand-held spirometer instead of a conventional spirometer, and the other is a screening method using specific questionnaires.

An association between pulmonary function and serum vitamin D levels has been reported in some studies. It has been reported that vitamin D deficiency correlates with the severity of COPD[21] (Janssens et al., 2010). Also, it has been reported that a significant relation between FEV1 and serum 25-hydroxy vitamin D levels (Azargoon et al., 2011)[22]. The studied population showed a mean age of 54.71 years with a male 82% and female 18%. A history of smoking was present in 78% of the patients. The most common

presenting symptom was dyspnoea in 78% patients followed by fatigue in 63% of the patients. Cough, Fever and Musculoskeletal pain was present in 44%, 39% and 28% respectively. After Spirometric evaluation and bronchodilator testing 33% of the patients were classified into moderate COPD, 51% were classified as severe COPD and 16% patients were found to have very severe disease. Out of the 180 patients, 46 of them (46%) presented in exacerbation. Similar observation were reported in various study. This is in conjunction with various studies conducted by Parasuramalu et al, Jindal et al and Mahesh et al which showed that the prevalence of COPD increases with age and is more common in males. Also the association is more common in people who smoke than in those who are non smokers[23-25]. A study conducted by Hornikx et al showed significant improvement in inspiratory muscle strength and oxygen consumption with supplementation of vitamin D[26,27].

Since vitamin D is supplied by food or sunlight exposure, vitamin D concentrations are largely influenced by the duration of sunshine, obesity, and calcium intake. Therefore, 25(OH)D concentration probably varies by region. The definitions of vitamin D insufficiency

as 25(OH)D levels of <30 ng/mL and vitamin D deficiency as 25(OH)D levels of <20 ng/mL were presented as Clinical Practice Guidelines by the Endocrine Society in the USA, and it is unclear whether these standards are valid in Japan.

### Conclusion

The study concludes that vitamin D deficiency is more prevalent in the patients with COPD and the frequency increases with the severity of the disease. The association between 25(OH)D levels and COPD did not meet the level of statistical significance in the present study. Due to paucity of data further studies with a longer follow up period are recommended.

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