Original Article

Study On Vitamin D Status In Patients With Chronic Obstructive Pulmonary Disease

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Abstract

Background: COPD is a progressive disease characterized by persistent airflow limitation, due to chronic inflammation and structural changes and is the fourth leading cause of mortality. COPD patients suffer from progressive reduction of lung function, loss of exercise capacity, frequent disease exacerbations, and development of extrapulmonary comorbidities. Some studies indicate the possible association between COPD and vitamin D; however, the conclusion was not definite. Two meta-analyses on the roles of vitamin D in COPD have been conducted. Objectives of the Study: The objectives of the present study are to estimate the serum levels of 25OH vitamin D in COPD patients and to check association if any between vitamin D levels and severity of COPD. Methodology: : Plain chest X-ray (PA view), Complete blood count was done by automated cell counter, liver, renal function tests and random blood sugar were determined using automated biochemistry analyser, Serum ionized calcium (Ca) was determined by ion selective electrode, Electrocardiogram (ECG), Pulmonary function tests (PFTs) using 2130 spirometer and serum sample was used for Vitamin D levels measurement. Results: vitamin D levels were decreased in all categories of COPD patients as per the GOLD criteria. Discussion and Conclusion: The results of our study indicate that the serum vitamin D levels were lower in patients with COPD, severe COPD, and COPD exacerbation. Vitamin D deficiency is associated with increased risk of COPD and severe COPD but not COPD exacerbation. The results provided an improved understanding of the roles of vitamin D in COPD development and progression. Further prospective, large, and well-designed studies are needed to confirm the results.

Keywords: chronic obstructive lung disease, vitamin D, pulmonary function tests and spirometer.

INTRODUCTION

COPD is a progressive disease characterized by persistent airflow limitation, due to chronic inflammation and structural changes and is the fourth leading cause of mortality [1, 2]. COPD patients suffer from progressive reduction of lung function, loss of exercise capacity, frequent disease exacerbations, and development of extrapulmonary comorbidities [3]. Vitamin D plays an important role in mineralisation of bone and homeostasis of calcium and phosphorus [4]. However, vitamin D is not just a vitamin. It is recognized as a pleiotropic prohormone with its receptor (vitamin D receptor [VDR]) ubiquitously distributed [5].

As an immunomodulatory effector, vitamin D can not only boost innate immune responses upon infection but also regulate adaptive immune responses [6]. Moreover, vitamin D is related to cell proliferation, cell differentiation, apoptosis, and intercellular adhesion [7].

Majority of vitamin D originates from skin with sunlight exposure, and the remaining can be obtained from diet or supplements [8]. Epidemiologic studies reported that vitamin D deficiency is a global and important health issue [9].

Vitamin D deficiency can underpin the etiology of broad range of diseases, including autoimmune diseases, allergy diseases, endocrine and metabolic disorders, cancer, infections, and cardiovascular disorders [10, 11].

Some studies indicate the possible association between COPD and vitamin D, [12-14] however, the conclusion was not definite. Two meta-analyses on the roles of vitamin D in COPD have been conducted [15, 16].

However, the studies did not include enough articles, did not extract correct data, pooled the levels of vitamin D from serum and plasma, included participants with vitamin D supplement, or did not analyze the sources of high heterogeneity.

The present study was conducted to evaluate Vitamin D levels in COPD patients and to check if any correlation exists between vitamin D levels and severity of COPD.

OBJECTIVES OF THE STUDY:

The objectives of the present study are to estimate the serum levels of 25OH vitamin D in COPD patients and to check association if any between vitamin D levels and severity of COPD.

METHODOLOGY:

Site: This study was conducted in the Dept. of General Medicine, at Shri Balaji Institute of Medical Sciences, Mowa, Raipur.

Study population:

We included a total of 150 patients suffering from COPD and the diagnosis of COPD was based on Global Initiative for Chronic Obstructive Lung Disease (GOLD) [Definition: FEV1/FVC ratio <0.7]. Stable COPD was defined by the lack of hospitalizations, urgent care visitors antibiotics, or changes in medications within 4 weeks prior to study.

Study design: prospective cross-sectional study.
Sample size: 150 patients suffering from COPD.

Exclusion criteria:

TB, asthma, active cancer, diabetes, hypertension, ischemic heart disease, chronic kidney disease, liver failure, history of upper or lower respiratory tract infections or use of oral steroid within 1 month prior to study, as all these conditions are associated with a low serum level of vitamin D

All the patients and healthy controls had been subjected to the following: Full detailed history taking including (age, sex, smoking status, patient's medications, CAT score and GOLD stage). Clinical examination, body mass index (BMI), and 6 min walk test were also determined and 6 min walk distance (6MWD) was detected. Local chest examination.

Radiological and laboratory investigations:

Plain chest X-ray (PA view), Complete blood count was done by automated cell counter, liver, renal function tests and random blood sugar were determined using automated biochemistry analyser, Serum ionized calcium (Ca) was determined by ion selective electrode, Electrocardiogram (ECG)., Pulmonary function tests (PFTs) using 2130 spirometer results were obtained for forced vital capacity (FVC), forced expiratory volume in 1st second (FEV1), and FEV1/FVC percentage. Subjects who had FEV1/FVC <70% underwent post – bronchodilator spirometry test, 20 min following 2 puffs of salbutamol 200 mcg. Blood samples were collected, centrifuged within 2 h of sampling, and the serum was frozen and stored at −40 °C until analysed for measurement of serum 25-hydroxyvitamin D (25-OHD) by Chemiluminiscnece immuno assay. Vitamin D deficiency is defined by most experts as a 25-hydroxyvitamin D level of less than 20 ng/mL. A level of 25-hydroxyvitamin D of 21–29 ng/mL can be considered to indicate an insufficiency of vitamin D, and a level of 30 ng/mL or greater can be considered to indicate sufficient vitamin D.

STATISTICAL ANALYSIS:

Statistical analysis was done using Microsoft Excel spreadsheet, and statistical package for the social sciences (SPSS) version 20.0 software. Statistical significance was assessed using student t test and the value of p was calculated. A p value <0.05 is considered statistically significant.

RESULTS:

We included a total of 150 subjects in cross-sectional study. We measured Vitamin D levels in these subjects, COPD diagnosis was made based on GOLD criteria.

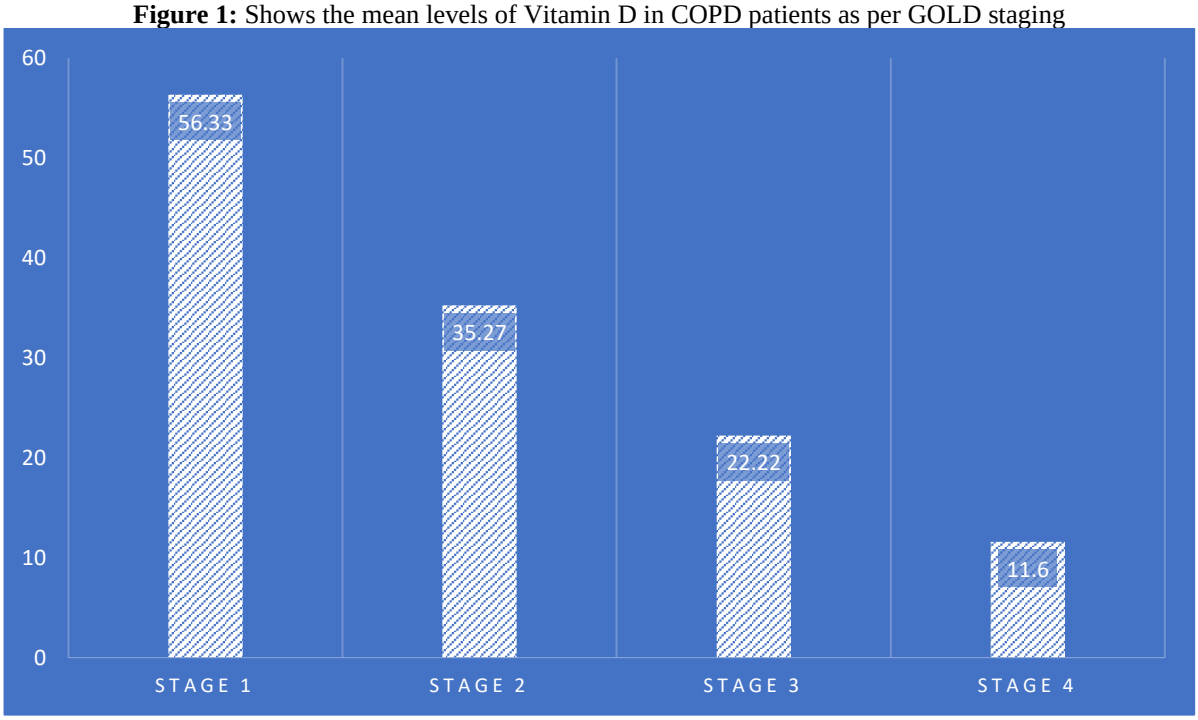
Table 1: Shows the Characteristic of the patients with COPD

Characteristics	Mean or Number
Total number of patients	150
Age in years (mean)	64.2±68.67
Male: Female	138:12
Pack year	28.71±14.20
Vitamin D levels (ng/mL)	26.765±15.38
Smoking status n (%)	
Current smoker	48 (32%)
Ex-smoker	94 (62.66%)
Non-smoker	8 (5.33%)
COPD severity	
Mild	12 (8%)
Moderate	48 (32%)
Severe	67 (44.66%)
Very Severe	23 (15.33%)

Table 2: Shows Vitamin D levels in COPD staging as per GOLD Criteria

	Stage 1	Stage 2	Stage 3	Stage 4
Vitamin D Levels	56.33±14.62	35.27±9.68	22.25±10.98	11.60±3.10

Figure 1: Shows the mean levels of Vitamin D in COPD patients as per GOLD staging



DISCUSSION:

The purpose of this study was to find correlation between serum 25 (OH) vitamin D levels and severity of disease in COPD patients.

Age Groups:

In our study, mean 25 (OH) vitamin D level was lower among older patients (>70 years) than younger patients (<69years). However, there was statistically no significant difference in 25 (OH) vitamin D levels according to different age groups with a p value of 0.083. Previous studies have described 25(OH) vitamin D deficiency as a common phenomenon in elderly populations. [17, 18]. Prior Studies by Jindal et al (2001), Mahesh et al (2009) and Parasuramalu et al (2014) suggested that the prevalence of COPD increases with age, which in turn may lead to decreased mobility and sun exposure [19, 20, 21]. Also, reduced dietary intake of 25(OH) vitamin D in COPD patients particularly in elderly can explain our outcome [22].

GOLD group:

GOLD groups were divided according to disease symptoms and risk. There was statistically highly significant negative correlation found between GOLD group and 25 (OH) vitamin D level with a p value of 0.001. In another words, patients with more severe symptoms had lower 25 (OH) vitamin D levels than those with less symptoms. Similar outcome was observed in a study by Kocabas A et al. in 2013 from Turkey, suggesting that the possibility of 25 (OH) vitamin D deficiency increased 4.83 times in GOLD group D, when compared to GOLD group A [23].

Serum 25 (OH) Vitamin D levels are efficient and suitable method for assessment of systemic vitamin D levels. The purpose of this study was to find correlation between serum 25(OH) vitamin D levels and severity of disease in COPD patients also to evaluate other factors associated with serum 25(OH) vitamin D levels in COPD patients. From the observations, we concluded that the majority of COPD patients were males. Decrease serum 25(0H) vitamin D levels were associated with increase airway obstruction, mean serum 25 (OH) Vitamin D levels were lower in older patients than younger and related to GOLD group D as compared to GOLD group A. Decrease serum 25 (OH) vitamin D were associated with increased pack years, increased frequency of exacerbation in self-declared previous year, lower socioeconomic status and in patients on inhaled corticosteroids.

CONCLUSION:

The results of our study indicate that the serum vitamin D levels were lower in patients with COPD, severe COPD, and COPD exacerbation. Vitamin D deficiency is associated with increased risk of COPD and severe COPD but not COPD exacerbation. The results provided an improved understanding of the roles of vitamin D in COPD development and progression. Further prospective, large, and well-designed studies are needed to confirm the results.

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