Section: General Medicine

Original Research Article

STUDY OF VITAMIN D STATUS IN COPD PATIENTS OF CHATTISGARH

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ABSTRACT

Background: Low Vitamin D levels have been associated with chronic obstructive pulmonary disease (COPD) and acute exacerbations. **Materials and Methods:** 70 (seventy) adult patients with COPD and chronic lung diseases were studied. BMI, 6-MWT, CXR, ECG, spirometry, and laboratory tests for 25 (OH) vitamin were carried out; season and dyspnea scale (mMRC) were also carried out to correlate the severity of lung diseases and vitamin D levels. **Result:** Comparison of mean serum 25 (OH) vitamin D level at different age groups, comparison of vitamin D level according to mMRC dyspnea scale, comparison of 6 MWT with vitamin D levels, and comparison of ICS therapy had significant p-values ($p < 0.001$). **Conclusion:** It is proved that decreased vit. D levels are observed in chronic respiratory diseases that lead to morbidity and mortality.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the top three causes of mortality worldwide.[1] Moreover, 90% of these deaths occur in low- and middle-income countries like India. The common respiratory symptoms of COPD include cough with or without sputum production and dyspnea; exacerbations of these symptoms may be triggered by respiratory infections with bacteria and/or viruses, environmental pollutants, or other unknown factors, resulting in increased airway inflammation during such episodes. During exacerbation there is an increase in gas trapping and hyperinflation, with decreased expiratory flow leading to increased dyspnea. There may also be a worsening of V/Q abnormalities resulting in hypoxia.[2]

Osteoporosis is one of the important clinical manifestations among the COPD patients, which adversely affects the quality of life.[3] Many patients with COPD confine themselves at home, which is not only due to breathlessness or wheezing but also due to severe bony pain, muscle wasting, and generalized weakness due to vitamin D deficiency.[4] Hence, an attempt is made to correlate the severity of COPD with levels of vitamin D in different age group patients.

MATERIALS AND METHODS

70 (seventy) adult patients aged between 40-85 years regularly visited the medicine department of Raipur Institute of Medical Sciences (RIMS) Godhi, Raipur-492101, Chhattisgarh were studied.

Inclusion Criteria

Patients diagnosed with COPD patients. The patient who gave their consent in writing for the study was selected.

Exclusion Criteria

Patients with pulmonary tuberculosis, pulmonary malignancy, or pulmonary emboli were excluded from the study.

Method: Every patient's clinical history usage of inhaled corticosteroid, season and dyspnea scale (mMRC), smoking history was determined as current smoker, ex-smoker, and never smoker; socio-economic status was recorded; physical examination, 6-MWT, BMI, CXR, ECG, spirometry, and laboratory tests for 25 (OH) vitamin D were carried out.

Serum 25 (OH) vitamin D level was measured by a fully automated antibody-based Chemiluminescent immuno assay (CLIA) ; serum 25 (OH) vitamin D level was the best marker of body vitamin D status. Spirometry was carried out using the Schiller sensor SP-260. Tests were performed in a sitting position before and 20 minutes after 2.5 mg salbutamol was given via nebulizer with a nose clip. Three to four trials were given. Best of all, trials were included where expiration continued for > 6 seconds with an acceptable flow volume loop. FEV1 and FEV1/FVC parameters were used to diagnose COPD and chronic respiratory failure, where FEV1% predicted were used in the study for severity of COPD and chronic respiratory failure assessment.

Duration of study was from February 2025 to November 2025.

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Statistical Analysis: Various characteristic features of patients, comparison of Vit. D levels, various age groups, grades of mMRC dyspnea, mean values of 6MWT, and users and non-users of ICS therapy were studied with ANOVA tests and t-tests. The statistical analysis was carried out using SPSS software. The ratio of male and female was 2:1.

RESULTS

[Table 1] Characteristic features of patients with COPD patients

- Total number of patients 70 vitamin D level was 26.82 (± 10.28) mMRC dyspnea (mean), 2.54 (± 0.42) 6 minute walk test (meter), 226.90 (± 140.50).
- FEV1% predicted: 50.82 (± 14.26) smoking status,23 (32.8%) were current smokers, 39 (55.7%) were ex-smokers, 8 (11.4%) non-smokers.
- Status of COPD: 6 (8.5%) had mild, 23 (32.8%) were moderate, 30 (42.8%) had severe, 11 (15.7%) were very severe.

[Table 2] Comparison of mean serum 25 (OH) vitamin D levels in different age groups –

- 18 patients were 40-59 years of age had 31.09 (±9.8) vit. D.
- 30 patients age between 60-69 year had 31.20 (± 8.80) vit. D.
- 16 patients were age 70-79 had 19.89 (± 7.80) vit. D.
- 6 patients were >80 years had 23.70 (± 4.40). F value is 7.35 and p<0.001 (p-value was highly significant).

[Table 3] Comparison of vitamin D levels accourding to mMRC dyspnea grade among COPD patients –

- 9 patients were grade I had 52 (± 9.20).
- 20 patients were grade II had 36.89 (±8.20
- 25 patients were grade III had 24.28 (± 7.2)
- 16 patients were grade IV had 14.10 (± 4.03), F value is 61.19 and p<0.001 (p-value was highly significant).

[Table 4] Comparison of mean value of vitamin D levels according to 6-minute walk test among COPD patients –

- 12 patients walked >400 meters had 48.70 (± 7.06) vit. D level.
- 11 patients walked 399-300 meters had 39.02 (± 8.20) vit. D level.
- 7 patients walked 299-200 meters had 30.02 (± 6.10) vit. D level.
- 25 patients walked 199-100 meters had 20.10 (± 3.12) vit. D level.
- 15 patients walked <99 meters had 11.02 (± 2.80) vitamin D level, F value is 112.0 and p<0.001 (p-value was highly significant).

[Table 5] Comparative of inhaled corticosteroid (ICS) therapy among COPD patients: ICS therapy-37 were included, 20.42 (± 2.10) was vit. D level, 33 were not included in ICS therapy 32.63 (± 5.5), t test was 12.4 and p < 0.001 (p-value was highly significant).

Table 1: Characteristic features of the patients with COPD

Characteristic	Mean or Number
Total number	70
Vitamin D level mean ng/m	26.82 (± 10.28)
mMRC dyspnea (mean)	2.54 (± 0.42)
6 minutes walk test (metre)	226.90 (± 140.50)
FEV1% predicted	50.82 (± 14.26)
Smoking status	
Current smoker	23 (32.8%)
Ex-smoker	39 (55.7%)
Non-smoker	8 (11.4%)
COPD Status Mild	6 (8.5%)
Moderate	23 (32.8%)
Severe	30 (42.8%)
Very severe	11 (15.7%)

Table 2: Comparison of mean serum 25 (OH) vitamin D levels in different age groups

Age groups (years)	Number of patients	Mean (±SD)	t test F value	p value
40-59 years	18	31.02 (±9.82)	7.35	P<0.001
60-69 years	30	31.20 (±8.80)		
70-79 years	16	19.89 (±7.80)		
> 80 years	6	23.70 (±4.40)		

(p<0.001 = p value is highly significant)

Table 3: Comparison means vitamin D level according to mMRC Dyspnea grades among COPD patients

mMRC Dyspnea	Number of patients	Vit. D level ng/ml	ANOVA F	p value
Grade – I	9	52 (±9.20)	61.19	P<0.001
Grade – II	20	36.89 (±8.20)		
Grade – III	25	24.28 (±7.2)		
Grade – IV	16	14.10 (±4.03)		

p value is highly significant (p<0.001)

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Table 4: Comparison of mean values of vitamin D levels according to 6 minutes walk test among COPD patients

6 minute walk test 6 (MWT)	Number of patients	Vit. D level ng/ml (Mean ±SD)	ANOVA F value	p value
> 400 metre	12	48.70 (±7.06)	112.0	P<0.001
399-300 metre	11	39.02 (±8.20)		
299-200 metre	7	30.02 (±6.10)		
199-100 metre	25	20.10 (±3.12)		
< 99 metre	15	11.02 (±2.80)		

p value is highly significant (p<0.001)

Table 5: Comparison of Inhaled corticosteroid (ICS) therapy among COPD patients

ICS Therapy	Number of patients	Vit. D level ng/ml (Mean ±SD)	t test	p value
Yes	37	20.42 (±2.10)	12.4	P<0.001
No	33	32.63 (±5.5)		

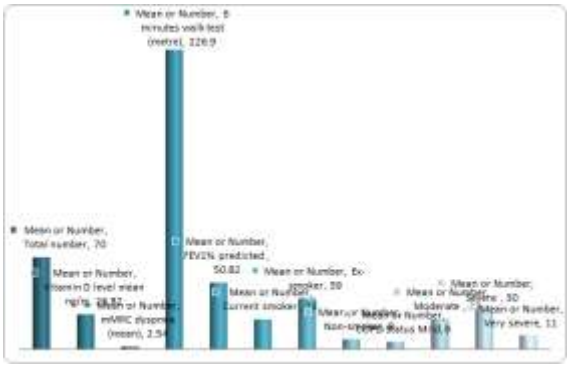

Figure 1: Characteristic features of the patients with COPD diseases

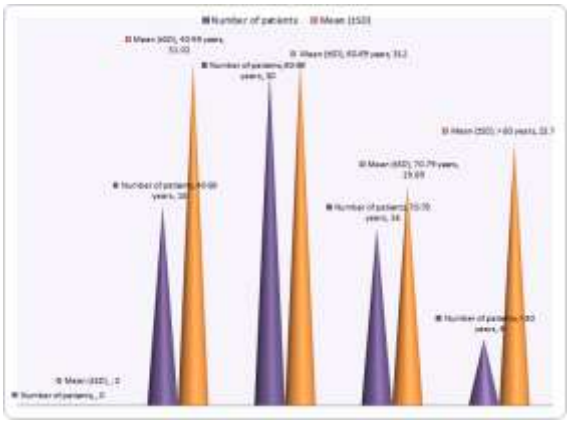

Figure 2: Comparison of mean serum 25 (OH) vitamin D levels in different age groups

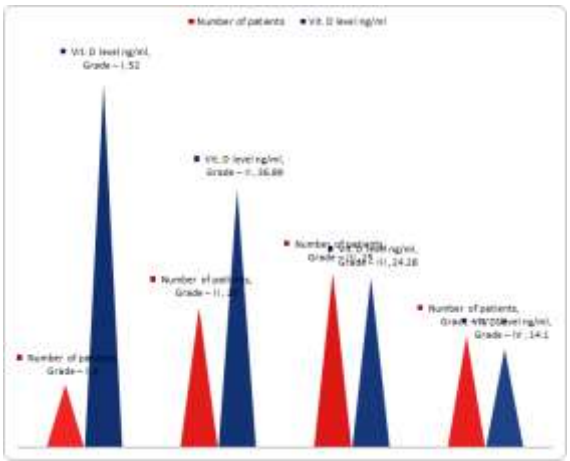

Figure 3: Comparison means vitamin D level according to mmRC Dyspnea grades among COPD patients

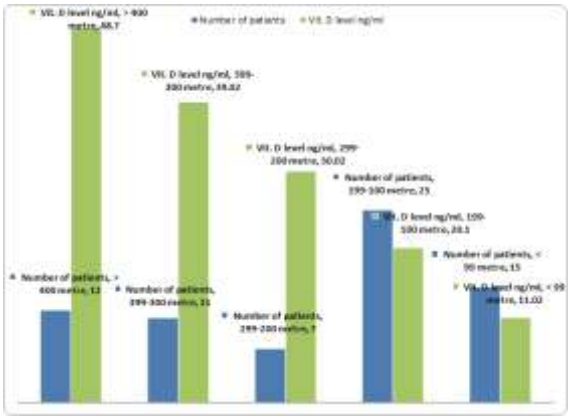

Figure 4: Comparison of mean values of vitamin D levels according to 6 minutes walk test among COPD patients

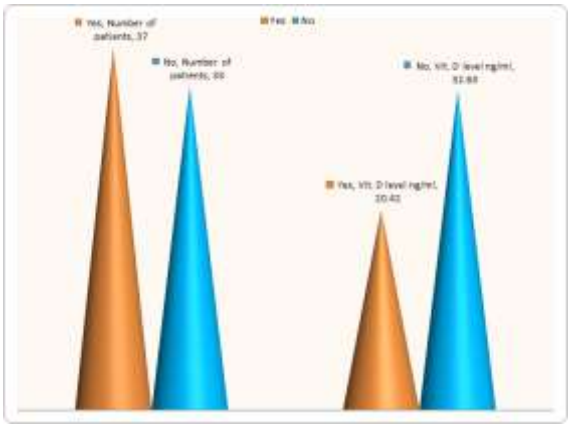

Figure 5: Comparison of Inhaled corticosteroid (ICS) therapy among COPD patients

DISCUSSION

Present study of vitamin D status in COPD patients. The characteristic features of patients vit. D mean level were 26.82 (± 10.28), the mMRC mean value was 2.54 (± 0.42), and the 6 MWT test meter mean value was 226.90 (± 140.50). Mean value of FEV1 predicted: 50.82 (± 14.26) 23 (32.8%) current smokers, 39 (55%) ex-smokers, and 8 (11.4%) non-smokers; COPD status: 6 (8.5%) mild, 23 (32.8%) moderate, 30 (42.8%) severe, and 11 (15.7%) very severe [Table 1]. Comparison of mean severe 25 (OH) vit. D levels had a significant p-value (p < 0.001) [Table 2]. Comparison of vit. D levels

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according to the mMRC scale at different grades had a significant p-value ($p < 0.001$) [Table 3]. Comparison of mean values of vit D in the 6-minute walk test (6 MWT) in different meters had a significant p-value ($p < 0.001$) [Table 4]. In comparison of ICS in usage and non-usage of patients, there was a significant p-value ($p < 0.001$) [Table 5]. These findings are more or less in agreement with previous studies.[5-7]

Patients with COPD are at high risk of being vitamin D deficient due to a variety of reasons: aging skin is less effective in producing vitamin D, poor nutrition and outdoor activities, increased catabolism of vitamin D by steroids, and lower storage capacity.[8] The normal functioning of both innate and adaptive immunity is dependent on vit-D, such as the maturities of dendritic cells, negative regulation of pro-inflammatory cytokines and chemokines, and maturation and development of T cells, especially Th1 cells.[9] Vitamin D is also linked to apoptosis and intracellular adhesions. Increased expression of antimicrobial peptides such as cathelicidin and beta defensins is an important function of vit D to maintain homeostasis.[10] Immune cells both vit. D receptor (VDR) and hydroxylase enzyme and can potentially reduce the pathogenic load of micro-organisms. Vit. D in airway epithelium helps to kill pathogens via TLS and CD 14-dependent mechanisms. The vitamin D receptor (VDR) is an important nuclear hormone receptor, and animal studies have confirmed that VDR has observed lung changes. Similar to COPD and chronic respiratory failure, increased inflammation and up-regulation of various matrix metalloproteinases (MMPs),[11] lead to early-onset emphysema and decline in lung functions. Higher exercise capacity and carbon monoxide transfer capacity were associated with higher levels of vitamin D levels.[12]

CONCLUSION

Present study of vitamin D status in COPD patients. It is observed that vit. D level is significantly decreased in COPD patients. Such studies must be conducted in a large number of patients to confirm present significant results because the exact patho-physiology of COPD associated with reduced level of vit D is still unclear.

Limitation of study: Owing to the remote location of the research center, a small number of patients, lack the latest techniques, and we have limited findings and results.

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