

Original Article

Study of Serum Vitamin D Level in Patients Having Chronic Obstructive Pulmonary Disease

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Introduction : Chronic Obstructive Pulmonary Disease (COPD) is defined as a disease state characterised by airflow limitation that is not fully reversible. COPD includes both emphysema as well as chronic bronchitis. According to recent studies, there is a significant relation between Vitamin D levels and lung function.

Materials and Methods : A hospital based observational case control study of one year duration was conducted in the Department of Medicine, Silchar Medical College and Hospital with 100 COPD patients and 100 age and sex matched controls. A spirometry was performed on all patients, along with bronchodilator reversibility testing. A post-bronchodilator FEV₁/FVC of <0.7 confirmed the diagnosis of COPD as per the GOLD 2019 guidelines. Serum 25(OH) vitamin D was measured using auto-analyser ACCESS 2 immunoassay system.

Observations and Results : Mean age of patients in the cases and control groups were 60.4 and 60 years respectively. Mean of serum vitamin D in cases (17.97ng/ml) was significantly lower than controls (24.28 ng/ml). The mean vitamin D levels in GOLD group 2,3 and 4 were 27.442 ng/ml, 18.890 ng/ml and 14.22 ng/ml respectively.

Conclusion : There is high prevalence of vitamin D insufficiency among COPD patients and more so amongst patients with severe form of COPD. It is reasonable to conclude that deficiency of Vitamin D may be a factor in the development and progression of COPD and hence, replacement therapy of Vitamin D may be an effective public health intervention to improve vitamin D status in the population.

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Key words : COPD, Vitamin, Case, Control, Patients.

COPD includes emphysema, an *anatomically* defined condition characterized by destruction and enlargement of lung alveoli; and chronic bronchitis, a *clinically* defined condition with chronic cough and phlegm¹. COPD is a preventable and treatable condition which is a disease of increasing public health importance around the world. Recent speculations suggest that COPD will rise from the sixth to the third most common cause of mortality world wide by 2020². Vitamin D is a fat-soluble vitamin that regulates important number of body functions including calcium absorption, bone metabolism, neuromuscular function and immunity. Despite the classical role of vitamin D in skeletal health, new aspects of vitamin D have been discovered in tissues and organs other than bones. Vitamin D deficiency is defined as having serum levels of 25-hydroxyvitamin D of less than or equal to, 20 ng/ml. According to recent findings, the prevalence of vitamin D deficiency is between 33% and 77% among advanced COPD patients³. Lower levels of vitamin D in these patients may be explained by the reduction

Editor's Comment :

- It is concluded from the present study that low serum vitamin D is present in two third of the subjects with Chronic Obstructive Pulmonary Disease and more so amongst patients with severe form of COPD.
- It is reasonable to conclude that deficiency of vitamin D may be a factor in the development and progression of COPD and hence, replacement therapy of vitamin D may be an effective public health intervention to improve vitamin D status in the population.

in cutaneous Vitamin D production by smoking and limited sunlight exposure. Other possible mechanisms include reduced Vitamin D production in liver and kidney and increased Vitamin D sequestration in adipose tissue.

Aims of the Study :

- (1) To assess the levels of serum Vitamin D in patients admitted with acute exacerbation of COPD.
- (2) To correlate the values with severity of disease

MATERIALS AND METHODS

This study will be conducted in the Department of Medicine Silchar Medical College and Hospital, Silchar, Assam.

Study Period : The study will be conducted among the indoor patients in the Department of medicine, Silchar Medical College over a period of one year from 1st June, 2018 to 31st May, 2019.

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Study Design : The present study will be a hospital based observational study.

Sample Size : All patients presenting with COPD in Medicine IPD and OPD, Department of Silchar Medical College over a period of one year from 1st June 2018 to 31st May 2019.

A detailed clinical history was taken and complete physical examination was done in all cases. A spirometry was performed on all patients, along with bronchodilator reversibility testing. A post-bronchodilator FEV₁/FVC of <0.7 confirmed the diagnosis of COPD as per the GOLD 2019 guidelines². Severity of COPD was assessed using FEV₁% predicted values. The access 25-(OH) Vitamin D assay is a paramagnetic particle, chemiluminescent immunoassay for the quantitative determination of 25-hydroxyvitamin D levels in human serum using the Access 2 Beckman Immunoassay Systems.

The results for each parameter for discrete data are represented in numbers, percentages and average (mean, standard deviation) are represented for continuous data which are represented in Tables 1-3 and Figs 1-3.

RESULTS

Out of the 100 cases of COPD and 100 controls, maximum number of subjects were seen in the age groups of 56-65 years (39/100 in case and 39/100 in control group). The next commonest age group was 66-75 years with 28% of the cases and 29% controls. The next commonest age group was 66-75 years with 28% of the cases and 29% controls. 26% of cases were between the ages of 46-55 years. The least

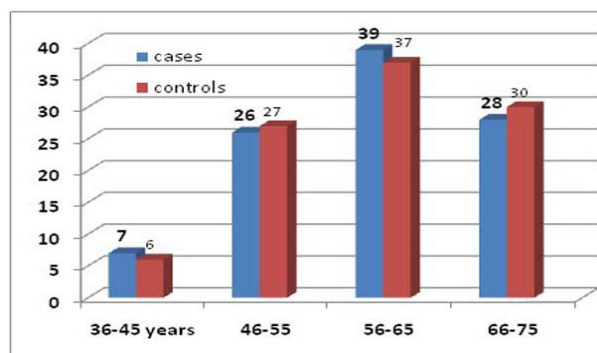


Fig 1 — Bar chart showing the Age distribution of the patients

GOLD SEVERITY STAGING OF COPD PATIENTS

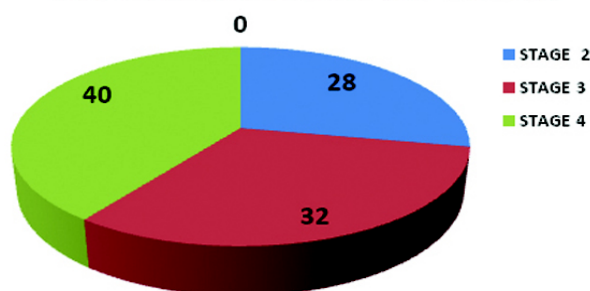


Fig 2 — Pie chart showing the GOLD staging of COPD patients

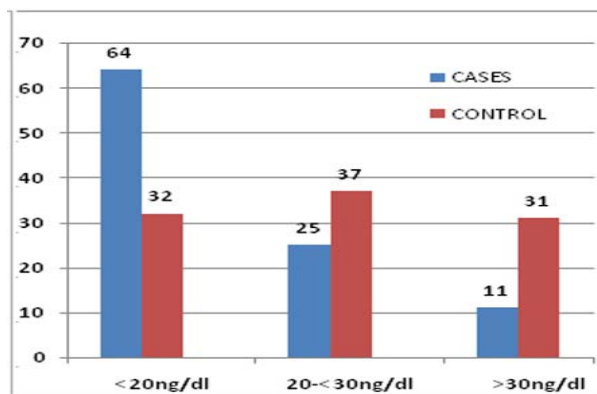


Fig 3 — Bar diagram showing distribution of study groups based on serum Vitamin D levels

Table 1 — Showing mean ±SD of serum Vitamin D levels in COPD cases and controls		
Subjects	Mean (SD) of Serum Vitamin D Level (ng/ml)	P value
Cases	19.973 ±7.489	<0.00001
Controls	24.98 ± 8.42	

Table 2 — Distribution of study groups based on serum Vitamin D levels			
Serum Vitamin D levels(ng/ml)	Cases	Controls	P value
Deficiency (<20 ng/ml)	64(64%)	32 (32%)	0.0001
Insufficiency (20 to <30 ng/ml)	25(25%)	37(37%)	
Sufficiency (30-100 ng/ml)	11(11%)	31 (31%)	

Table 3 — Comparison of Mean Vitamin D Level according to Gold Group among COPD Patients				
Gold Groups	No of Patients	Mean Vitamin D Level (ng/ml)	SD	P Value
Group 2	28	27.442	7.975	<0.00001
Group 3	32	18.890	4.448	
Group 4	40	15.555	4.717	

number of subjects were seen between the ages of 36-45 years (7% cases and 7% controls). Mean age was 60.4 ± 8.7 years in COPD cases.

Out of 100 COPD patients, there were 40% patients with stage 4 GOLD severity, 32% patients with stage 3 GOLD severity and 28% patients with stage 2 GOLD severity.

The mean serum Vitamin D level was 19.9732±7.489 ng/ml among COPD cases and 24.84 ± 8.42ng/dl among controls. There was statistically significant difference in Mean (SD) of Serum Vitamin D levels between cases and controls (p value <0.05).

The above table shows that 64% COPD cases were Vitamin D deficient (<20 ng/ml) in comparison to 32% subjects in control group. Vitamin D insufficiency was seen in 25 % cases and 37% controls whereas vitamin D sufficiency was seen in 11% COPD cases and 31% controls. The final result was also statistically significant (p value <0.05).

The above table shows that 28% of COPD patients were in GOLD group 2, 32% patients were in group 3 and 40% patients in GOLD group 4. The mean vitamin D levels in Gold group 2,3 and 4 were 27.442 ng/ml, 18.890 ng/ml and 15.555 ng/ml respectively and the results were statistically significant with p value <0.0001.

DISCUSSION

Many similar studies have demonstrated significantly lower serum 25(OH) vitamin D level in people with COPD. Janssens *et al*³ in Belgium in their study observed that Serum Vitamin D level was 19.9 ± 8.2 ng/ml in COPD cases and 24.6 ± 8.7 ng/ml in controls. It was observed that 51.9% of COPD patients were having vitamin D deficiency as compared to only 30.92% in the control group.

In the study by Duckers *et al*⁴ in 2011, prevalence of vitamin D deficiency was observed in 80% of COPD patients compared to 20% in healthy control group. Mean vitamin D levels were significantly lower (mean 11.4 ± 1.9 ng/ml) in COPD patients than in control groups (16.1 ± 1.4 ng/ml).

Zhou *et al*⁵ in their case control study in China in 2012 observed vitamin D deficiency in 94.3% of COPD cases and 84.19% of controls. Also, there was a significant difference in the mean of serum vitamin D levels between COPD cases and controls (12.86 ± 4.3 in cases and 14.34 ± 4.97 in controls, p value <0.0001). Sanket S *et al*⁶ in his study in 2015 also reported similar results. In that study, mean concentration of 25-(OH) vitamin D was 22.24 ng/ml in COPD cases which was significantly low compared with control group whose mean concentration of 25-(OH) vitamin D was 26.25 ng/ml. In the study done by Kumar *et al*⁷ where the mean serum vitamin D level was highest in GOLD group A patients (59.33 ± 15.51 ng/ml) and lowest in GOLD group D patients (17.81 ± 8.74 ng/ml). There was statistically highly significant negative correlation between GOLD group and mean serum vitamin D. In the study done by Gupta *et al*⁸ where the mean serum vitamin D level was highest in patients with mild COPD (27.73 ± 2.72 ng/ml) and lowest in patients with very severe disease (9.65 ± 4.57 ng/ml) and the results were statistically significant.

Limitation : The study was a hospital based study with a small sample size conducted over a limited

period of 1 year. So, to gather more detailed information regarding serum vitamin D status in COPD patients, we need a broader study covering a larger number of patients over a longer time period. Our study did not take into account few confounding factors like dietary habits and parathyroid hormone levels.

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Conflict of Interest : None

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