

ORIGINAL ARTICLE

Serum Vitamin D Level in Chronic Obstructive Pulmonary Disease and its Relation with Severity

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ABSTRACT

Introduction: The COPD is a serious epidemic-level public health issue. Patients with COPD have been found to have low vitamin D serum levels in a number of studies.

Aim: The goal of the study was to determine whether there was a relationship between vitamin D serum levels and the severity of COPD by comparing the levels in COPD patients at stages II, III, and IV to those in the control group.

Study Design: A Cross-sectional study

Place and Duration: In the Pulmonology department of Lady Reading Hospital, Peshawar and District Headquarter Hospital, Timergara Dir-Lower KPK during the period from January 2022 to June 2022.

Methods: The study included 140 participants in total, including 70 COPD patients and 70 controls for comparison. Patients were included from the outpatient department and medical wards. According to GOLD guidelines, advanced COPD staging II, III, and IV were done. In SPSS 21.0, inferential and descriptive statistics were accomplished.

Results: COPD was found in 34.3%, 37.1%, and 28.6% of people in stages II, III, and IV, respectively. There was a statistically significant relationship between lower vitamin D levels and advanced COPD patients, with the mean vitamin D serum concentration in COPD patients being 16.01 ng/ml and the vitamin D mean concentration in healthy controls being 35.98 ng/ml. ($p < 0.0001$). The severity of COPD was supposed to be inversely related with vitamin D serum levels.

Conclusions: The vitamin D serum levels were found lesser in patients with advanced COPD (stages II, III, and IV) than in the general population correlated with GOLD staging.

Keywords: Global initiative for chronic obstructive lung diseases; Chronic obstructive pulmonary disease and Vitamin D levels

INTRODUCTION

One of the most prevalent respiratory diseases in clinical practice that can be prevented and treated is chronic obstructive pulmonary disease (COPD)^{1,2}. There will be enormous morbidity and mortality as a result, which has serious implications for world health. Only myocardial infarction, cancerous tumors, and cerebrovascular disease cause more deaths globally than it, making it the fourth largest cause of mortality overall^{3,4}. One of the top 10 main causes of mortality is COPD, and mortality rates are rising. Vitamin D has pleiotropic effects in addition to being a micronutrient, such as anti-proliferative, anti-inflammatory, immunological and pro-differential effects^{5,6}. It appears to play a role in various diseases, including COPD, as a result of its varied mode of actions. Numerous studies have analyzed the relationship between the severity of COPD and low vitamin D serum levels. Vitamin D maintains healthy bones, muscles, and blood vessels in addition to being effective for COPD rehabilitation⁷. It has been found that vitamin D therapy helps advanced COPD patients with lower vitamin D serum levels⁸. Numerous researches have found low vitamin D serum levels in COPD patients⁹. The goal of the study was to determine whether there was a relationship between vitamin D serum levels and the severity of COPD by comparing the levels in COPD patients at stages II, III, and IV to those in the control group.

METHODS

This cross-sectional study was held out at the Pulmonology department of Lady Reading Hospital Peshawar and District Headquarter Hospital, Timergara Dir-Lower KPK during the period from January 2022 to June 2022. The study included 140 participants in total, including 70 COPD patients and 70 controls for comparison. Patients were included from the outpatient department and medical wards. According to GOLD (Global Initiative for Chronic Obstructive Lung Diseases guidelines); advanced COPD staging II, III, and IV were done. Stages II, III, and IV of COPD were labelled based on the physical examination, clinical history, post-bronchodilator pulmonary function test (PFT); FEV1 less than 80% and FEV1/FVC less than 70% of the

predicted value for gender and age and chest X-ray were used to categorise advanced COPD stages. Patients without COPD, > 40 years of age were taken as the controls. The subjects with sarcoidosis, chronic kidney disease, persistent lethargy, non-specific body ache, asthma, active malignancy, use of oral steroids, hypocalcaemia, patients taking vitamin D supplements and antiepileptic medications were not included. From patients and control group, vitamin D serum levels were evaluated. The Chemi Luminescent Immunoassay (CLIA) was used to measure the levels of serum vitamin D. SPSS 20.0 was applied for inferential and descriptive statistics. For descriptive statistics, mean, S.D and frequency were determined. For inferential statistics; Pearson's correlation test, independent t-test, one-way ANOVA test and chi-square test were accomplished, with $p < 0.05$ being considered statistically significant.

RESULTS

COPD patients have age range from 40-80 years, with 62.21 ± 11.95 years of a mean age. The control group's age varies from 35-75 years, with 57.1 ± 8.2 years of mean age. The study population's gender distribution was 45.7% men ($n=32$) and 54.3% women ($n=38$) in the patient's group with COPD, or 42.9% males ($n=30$) and 57.1% females ($n=40$) in the control group.

Table-1: shows the patients demographic features

Characteristics	COPD group	Control group
Males	32(45.7%)	30(42.9%)
Females	38(54.3%)	40(57.1%)
Age Range	40-80 years	35-75 years
Mean age	62.21 ± 11.95 years	57.1 ± 8.2 years

There was a statistically significant relationship between lower vitamin D levels and advanced COPD patients, with the mean vitamin D serum concentration in COPD patients being 16.01 ng/ml and the vitamin D mean concentration in healthy controls being 35.98 ng/ml. ($p < 0.0001$). (Table 2).

20 patients in the patients with COPD group had severe Vitamin D deficiency, only deficiency was found in 35 patients, insufficiency was noticed in 9 subjects and 6 subjects have normal

vitamin D serum levels. In the control group; 2 individuals have deficiency, insufficiency was noticed in 25 subjects, 42 have normal vitamin D serum levels and only one case has severe deficiency.

Table-2: shows the Levels of serum Vitamin-D in COPD and control group

Study Groups	Serum vitamin D level (ng/ml)				
	Minimum	Maximum	Mean	S. D	P-Value
COPD group	7.95	41.80	16.01	7.01	<0.0001
Control group	17.57	89.56	35.98	11.24	

COPD was found in 34.3%, 37.1%, and 28.6% of people in stages II, III, and IV, respectively. Table 3. The vitamin D serum concentrations in various COPD stages tended to decrease with upsurging COPD severity in in GOLD staging. The levels of vitamin D among both groups did not differ statistically significantly, though ($p=0.398$).

Table-3: shows the vitamin-D serum levels in various stages of COPD according to GOLD staging

COPD GOLD Staging	No of patients	Serum vitamin D level (ng/ml)			
		Minimum	Maximum	Mean± S. D	P-value
Stage-IV (Very severe)	20(28.6%)	7.8	38.8	12.10± 7.92	0.398
Stage-III (severe)	26(37.1%)	7.8	24.2	16.20± 4.62	
Stage-II (Moderate)	24(34.3%)	7.9	34.5	17.91± 8.26	

DISCUSSION

There was a statistically significant relationship between lower vitamin D levels and advanced COPD patients, with the mean vitamin D serum concentration in COPD patients being 16.01 ng/ml and the vitamin D mean concentration in healthy controls being 35.98 ng/ml. ($p<0.0001$).

Similar findings were made by Nasef Abdel et al., who found that the average serum vitamin D level in patients with COPD was 12.10 ± 2.35 ng/dl¹⁰⁻¹¹. In this study, subjects with severe COPD (stages II, III, and IV) had low vitamin D serum levels than the control group. These results are comparable with various researches comparing vitamin D serum levels in patients with COPD¹²⁻¹³. When compared to age, sex, and smoking controls, a cohort of COPD patients showed a significantly higher risk of vitamin D deficiency, according to Janssens et al study. In the same study, it was shown that 60% to 77% of GOLD stage III and IV patients had a vitamin D deficiency of 8 ng/mL, in contrast to 32% of cigarette-smokers with normal lung capacity and function¹⁴⁻¹⁵.

Additionally, the serum vitamin D level in 9 individuals in the very severe COPD group was less than 8 ng/mL, which was presumed to be 8 ng/mL at the time of analysis and the results were comparable to in Ali Kocbas et al study¹⁶⁻¹⁷. According to a study done on 46 patients in a nursing home in Nepal by Shrestha S and colleagues from the Nepal Medical College, 36 of the patients had insufficient levels of vitamin D while 41 of the patients had low levels¹⁸⁻¹⁹. The similar analysis found that people > 50 years of age had low vitamin D levels than people less than fifty years of age²⁰. In the study by Vieth et al., age-related changes in serum vitamin D levels were not observed. Increases in serum vitamin D levels with ageing are unavoidable yet necessary²¹⁻²². This analysis supposed that vitamin D serum levels are lower in advanced COPD patients (GOLD II, III, or IV stages) than in healthy controls which shows the Vitamin-D serum levels decrease with increased COPD severity.

CONCLUSION

Patients with advanced COPD (GOLD II, III, and IV stages) have low serum vitamin D levels compared to the general population, and these levels decline as the severity of COPD upsurges. Thus, vitamin D treatment may be considered to help COPD patients recover more quickly, live longer, and have lower rates of morbidity and mortality. However, nothing is known about the Pakistani

population's baseline serum vitamin D levels. The reference vitamin D level in a healthy population must therefore be determined through further research.

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