

## Levels of serum vitamin d among patients of chronic obstructive pulmonary disease and its association with severity: a case control study

Bibi Sarah Pandhiani<sup>1</sup>, Riaz Hussain Shah<sup>2</sup>, Khalil Ahmed Sanghro<sup>3</sup>, Bakht Ali Siyal<sup>4</sup>, Gordhan<sup>5</sup>, Aijaz Ahmed Laghari<sup>6</sup>

<sup>1</sup>Bibi Sarah Pandhiani, Assistant Professor Physiology, Bilawal Medical College, LUMHS Jamshoro, Pakistan. email: sarahpandhiani@hotmail.com

<sup>2</sup>Riaz Hussain Shah, Senior Registrar Medicine, Gamabat Institute of Medical Sciences Gambat, Pakistan. email: riazshah344@gmail.com

<sup>3</sup>Khalil Ahmed Sanghro, Senior Registrar Medicine, Ghulam Muhammad Mahar Medical College Sukkur, Pakistan email: Dr\_sanghro@yahoo.com

<sup>4</sup>Bakht Ali Siyal, Assistant professor Medicine, Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat, Pakistan. email: bakhtsiyal2014@gmail.com

<sup>5</sup>Gordhan, Associate professor Medicine, Muhammad medical college Mirpurkhas, Pakistan. email: drgordhan@hotmail.com

<sup>6</sup>Aijaz Ahmed Laghari, Specialist Medicine, Indus Hospital Bhong Sadiqabad, Pakistan. email: dr\_aijazlaghari@yahoo.com

Corresponding author: Bibi Sarah Pandhiani, Assistant Professor Physiology, Bilawal Medical College, LUMHS Jamshoro, Pakistan. email: sarahpandhiani@hotmail.com

### Abstract

**Aim:** To assess the levels of serum vitamin D among patients of chronic obstructive pulmonary disease and its association with severity

**Study Design:** A case control study

**Place and Duration:** This study was conducted in Bilawal Medical College, LUMHS Jamshoro, Pakistan from May 2019 to May 2020.

**Methodology:** Total 140 patients were registered in the study, consisting of 70 chronic obstructive pulmonary disease (COPD) patients and 70 control subjects for comparison. The stage of COPD was made according to the guidelines of Global Initiative for Chronic Obstructive Lung Diseases (GOLD) and the stages II, III and IV were marked as advanced COPD. Equally inferential and descriptive statistics were achieved in SPSS version 24.0.

**Results:** The mean serum vitamin D concentration was  $16.20 \pm 8.20$  ng / ml in patients of COPD and ranges from 9 ng / ml to 39.1 ng / ml. The mean serum vitamin D concentration in the control group was  $32.81 \pm 13.11$  ng / ml (mean  $\pm$  SD) and ranged from 17.30 ng / ml to 90.70 ng / ml and statistically significant difference was found between control and patients' group ( $p < 0.0001$ ). The stage II COPD classified as moderate cases were (n=21)30%, Stage III COPD cases classified as severe were (25) 35.7% and stage IV COPD cases classified as very severe were (n=24) 34.3%. Serum levels of vitamin D have been institute to decline with advancing COPD severity.

**Conclusions:** Advanced COPD patients had low levels of serum vitamin D in comparison to the healthy people, and serum levels of vitamin D in COPD patients were correlated with the severity according to Global Initiative for Chronic Obstructive Lung Diseases guidelines.

**Keywords:** Vitamin D, Global Initiative for Chronic Obstructive Pulmonary Diseases, Chronic obstructive pulmonary disease.

### INTRODUCTION

COPD is the most treatable and avoidable respiratory illnesses in medicine <sup>1-2</sup>. It has important health inferences worldwide and is responsible for significant mortality and morbidity. Myocardial infarction is the 4<sup>th</sup> foremost source of mortality in the world, second only to cancer and diseases of the brain vessels<sup>3-4</sup>. COPD is solitary among the 10<sup>th</sup> foremost reason of demise where death rate continues to increase. In addition to be a micro-nutrient, vitamin D have pleiotropic impacts, counting antiproliferative, immunological, pro-differentiative and anti-inflammatory properties. Because of its various activities, its role in many diseases, including COPD, has emerged.

Several studies have found an association between low levels of serum vitamin D and the COPD severity<sup>5-6</sup>. Vitamin D additionally helps maintain cardiovascular and bone healthiness which is believed to be advantageous

in the recuperation therapy of COPD. Vitamin D supplementation are beneficial in COPD with advanced stages and with low levels of serum vitamin D<sup>7-8</sup>. Numerous analyses have revealed low serum vitamin D levels in COPD patients<sup>9</sup>. The purpose of this study is to assess serum vitamin D serum levels among COPD affected patients and compare severity of COPD with serum vitamin D levels.

### METHODOLOGY:

This case control study was conducted at Bilawal Medical College, LUMHS Jamshoro, Pakistan from May 2019 to May 2020. Permission was taken from the ethical committee of institute. Total 140 patients were registered in the study, consisting of 70 COPD patients and 70 control subjects for comparison. The stage of COPD was made according to the guidelines of GOLD, and the stages II, III and IV were marked as advanced cases of COPD based on chest radiograph, physical examination, history, pulmonary function tests after giving bronchodilators. A cut of < 70% FEV1/ FVC ratio and < 80% FEV1 of the assumed for given sex and age was taken significant. Controls were recruited as people not having COPD, of age less than 40 years. The study excluded patients with persistent sleepiness, non-specific body pain, sarcoidosis, active cancer, chronic kidney disease, asthma, patients taking antiepileptic drugs, oral steroids, vitamin D supplements and hypocalcaemia.

Serum vitamin D levels were obtained from both control subjects and patients. Serum vitamin D levels were evaluated from the hospital laboratory using the chemiluminescent assay (CLIA). Both inferential and descriptive statistics were achieved in SPSS version 24.0. While descriptive statistics calculated standard deviation, mean and frequency. The one-way ANOVA, independent t-test, Pearson's correlation test and chi-square test were used in the inference statistics, and  $p < 0.05$  was taken as significant.

### RESULTS

The mean COPD incidence according to the age was  $66 \pm 11.77$  years (mean  $\pm$  SD), ranging from 45 to 87 years. The control group mean age was  $58.5 \pm 9.1$  years (mean  $\pm$  SD) and ranged from 43 to 81 years. By gender, 40% of the study population were men ( $n = 28$ ), 60% women ( $n = 40$ ) in the COPD patients' group, while there were 45.7% men ( $n = 32$ ) and 54.3% women ( $n = 38$ ) in the control group. The mean serum vitamin D concentration was  $16.20 \pm 8.20$  ng / ml in patients of COPD and ranges from 9 ng / ml to 39.1 ng / ml. The mean serum vitamin D concentration in the control group was  $32.81 \pm 13.11$  ng / ml (mean  $\pm$  SD) and ranged from 17.30 ng / ml to 90.70 ng / ml. There was statistically significant difference between control and patients' group ( $p < 0.0001$ ) (As shown in Table 1).

Total 18 (25.7%) cases have severe deficiency, only deficiency in 39 (55.7%) cases, 7 (10%) have insufficiency and normal vitamin D levels in 6 (8.5%) cases, none of the 70 patients in the control group have severe deficiency, only deficiency in 3 (4.3%), insufficient vitamin D levels in 32 (45.7%) and normal vitamin D levels in 35 (50%). The stage II COPD classified as moderate cases were ( $n=21$ )30%, Stage III COPD cases classified as severe were (25) 35.7% and stage IV COPD cases classified as very severe were ( $n=24$ ) 34.3% . In stage II, III and IV; the levels of Serum vitamin D in COPD were given in Table II. Serum vitamin D levels have been institute to decline with advancing COPD severity according to the staging of GOLD.

Table 1: Serum level of Vitamin D in cases and controls

Study groups	Serum level of vitamin D (ng/ml)				p-value
	Mean	Min.	SD		
Cases	16.20	39.1	9.00	8.20	<0.0001
Control	32.81	90.00	17.30	13.11	

Table-II. Serum vitamin D levels comparison in various COPD stages

COPD GOLD staging	Number of cases (n=70)	Serum levels of vitamin D		
		mean $\pm$ SD	Minimum	Maximum
Stage-II (Moderate)	21 (30%)	17.10 $\pm$ 7.12	7.8	40.1
Stage-III(Severe)	25 (35.7%)	14.97 $\pm$ 5.28	7.9	25.8
Stage-IV (Very severe)	24 (34.3%)	12.92 $\pm$ 8.09	8.2	41.2

(p - Value = 0.37).

## DISCUSSION

In this analysis, serum vitamin D mean concentration was  $16.20 \pm 8.20$  ng / ml in patients of COPD and ranges from 9 ng / ml to 39.1 ng / ml. The mean serum vitamin D concentration in the control group was  $33.99 \pm 12.37$  ng / ml (mean  $\pm$  SD) and ranged from 17.30 ng / ml to 90.70 ng / ml. There was statistically significant difference found between control and patients' group ( $p < 0.0001$ ). This is analogous to the discovery of Nasef Abdel et al, who exhibited that the mean concentration of vitamin D in the serum of COPD patients was  $11.80 \pm 2.40$  ng / dl<sup>10-11</sup>.

In our study, 93% of advanced stages of COPD (stage II, III, IV) cases had decrease vitamin D serum levels ( $p < 0.0001$ ), in comparison with 43% in the control group. These findings are in line with the results of other studies comparing serum vitamin D levels in COPD patients<sup>12-13</sup>. A Janssens et al, study showed a higher incidence of deficiency in vitamin D among COPD cases in comparison to the control group and were matched with the age, gender and smoking<sup>14-15</sup>. In the same study, they found that up to 61% and 78% of III and IV stage according to GOLD staging had a vitamin D deficiency  $< 8$  ng / ml, compared with 32% of smokers with normal functions of lungs.

A study of 46 patients found 41 were low in vitamin D and 36 were deficient<sup>16-17</sup>. In the same study, people over 50 had lower vitamin D levels than people under 50. In our analysis, no significant variance in levels of serum vitamin D was found with age, as studied by Vieth et al study<sup>18-20</sup>. This study demonstrates a serum vitamin D deficiency in advanced stages of COPD (GOLD II, III, IV) patients in comparison to healthy controls, which tends to decrease as the COPD severity increases.

## CONCLUSION

Patients with advanced COPD (GOLD II, III and IV stages) have lower levels of serum vitamin D than the normal people, and levels of serum vitamin D decrease as the COPD severity increases. Therefore, vitamin D supplementation may be given for better quality of life, good rehabilitation, and reduced mortality and morbidity in COPD patients. Though, the basal serum levels of vitamin D in the Pakistani population are not well established, therefore, more research is needed to determine basal vitamin D levels in a healthy Pakistani people.

### Permission:

It was taken from the ethical review committee of the institute

### Conflict of interest:

None

### Funding Source:

None

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