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Estimation of the Level of (25) Hydroxy Vitamin D in Elderly Patients with Chronic Obstructive Pulmonary Disease

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Abstract

Introduction: *Chronic obstructive pulmonary disease (COPD) is characterized by airflow obstruction that is not fully reversible. The airflow limitation is usually progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases. The airflow obstruction is due to a combination of airway and parenchymal damage.People over age 50 have an increased risk of vitamin D deficiency and the risk increases with ageIn elderly COPD, the risk of vitamin D deficiency is higher than expected and is linked with disease severity.*

Aim of the work:*The aim of the present work is to measure the level of 25, hydroxy-vitamin D in elderly with and without chronic obstructive pulmonary disease (COPD).*

Methods:*This study wasconducted on 60 subjects aged 60 years and above who were attending* ***Al Noor specialistHospital in holly Makah*** *and they were divided into two groups:*

Group I:30 patients with COPD.Group II:30 elderly non COPD subjects.All subjects were subjected to detailed history taking,clinical examination, and laboratory investigations. Serum (25) hydroxy vitamin D level was measured in (March, April 2013).Arterial blood gases when needed.GOLD grading. Geriatric depression scale "short form". Charleston scores for co-morbidities.

Results:*This study showed that.In group I; 18 patients (60%) had mild to moderate 25(OH)D deficiency and 12 patients (40%) had sever deficiency, while in group II; 27(90%) had normal level and 3(10%) had mild to moderate deficiency Also there was statistically significant negative correlation between 25(OH)D level and GOLD grading.*

Conclusion: *25(OH)D deficiency is highly prevalent in elderly COPD patients and it is correlated with the disease severity.*

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I. Introduction

Vitamin D is a group of fat-soluble secosteroids responsible for intestinal absorption of calcium and phosphate. In humans, the most important related compounds of vitamin D are vitamin D2 and vitamin D3.(1) Cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2) are unique as they constitute what we know as vitamin D and can be ingested from the diet and/or supplements. The body can also synthesize vitamin D (from cholesterol) when sun exposure is adequate (hence its nickname, the "sunshine vitamin").(1-3)People over age 50 have an increased risk of vitamin D deficiency and the risk increases with age. As people age they lose some of their ability to synthesize vitamin D from sunlight. Vitamin D also needs to be activated in the kidney and this function also decreases with age. Finally, elderly people who are homebound are less likely to get outdoor exercise and activity. It has been suggested that it takes up to 30 minutes of sun exposure twice a week to make a sufficient amount of vitamin D from sunlight.(4) Vitamin D in particular calcitriol exerts anti-inflammatory effect and modulates airways reactions in response to several stimulants like gases and noxious particles.(5)Other risk factors include decreased dietary intake, reduced skin thickness, impaired intestinal absorption, and impaired hydroxylation in the liver and kidneys.(6)Chronic obstructive pulmonary disease (COPD), a common preventable and treatable disease, is characterized by airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases.(7-8) By 2020; COPD may become the 3rd leading cause of death worldwide.(9)Vitamin D deficiency is common across various populations as well as among several skeletal and non-skeletal conditions including autoimmune diseases, diabetes, pulmonary diseases.(10,11)There is an association between the risk of upper

respiratory infection and vitamin D deficiency in particular, the relation is stronger in patients with background respiratory disease.[12,13] The patients with pulmonary diseases such as asthma and chronic obstructive pulmonary disease (COPD) are at greater risk of vitamin D deficiency.[14,15] In elderly COPD, the risk of vitamin D deficiency is higher than expected and is linked with disease severity.[16,17]

AIM OF THE WORK

The aim of the current study was to measurelevels of 25(OH) vitamin D inelderly with and without COPD and to further evaluate the associations between important COPD characteristics to levels of 25(OH)vitamin D including; GOLD grading, BMI ,smoking index ,depression and exacerbation frequency .

SUBJECTS

The present study was conducted on 60 elderly subjects aged 60 years and above divided into two groups. Group I**:**included 30 elderly COPD patients. Group II**:** Included 30 elderly non COPD subjects. Patients who have renal disease, liver disease, malignancy were excluded and elderly COPD patients were included.

METHODS

All subjects were subjected to full history taking, full clinical examination and laboratory investigations .Serum 25(OH) vitamin D level was measured in (March, April 2013).Arterial blood gases when needed. (Global Initiative for Chronic Obstructive Lung Disease)GOLD grading[18].Geriatric depression scale.Charleston scores for co-morbidities.

II. Results

Demographic data (table I):

Age: Age in group I ranged 60-80(years) with the mean value(66.5 ± 6.4), while in group II ranged 60-77 years withthe mean value(65.8± 5.8).There was nostatistical significant difference as regard the age between the two groups.

Gender: In group I; 28patients were males (93.3%) and 2 were females (6.7%), while in group II; 26patients were males (86.7%) and 4 patients were females (13.3%).There was no statistical significant difference as regard the gender distribution between the two groups.

Table (1): Demographic data of the two studied groups

Demographic data	Group I (n=30)		Group II (n=30)		Significance
	No.	%	No.	%	
Gender					
Male	28	93.3	26	86.7	^{FE}P=0.671
Female	2	6.7	4	13.3	
Age (years)					
60-	14	46.7	14	46.7	
65-	7	23.3	6	20.0	
70-	4	13.3	7	23.3	
75-≤80	5	16.7	3	10.0	
Min-Max	60-80		60-77		t=0.446
Mean±SD	66.5±6.4		65.8±5.8		P=0.657

^{FE}P: Fisher's Exact testt: t-test

Serum 25 (OH) vitamin D level in the two studied groups (table II)[19].

In group I; 18 patients (60%) had mild to moderate 25 (OH) vitamin D deficiency and 12 patients (40%) had sever deficiency, while in group II; 27(90%) had normal level and 3(10%) had mild to moderate deficiency. There was statistical significant difference as regard serum 25 (OH) vitamin D level between the two groups (p<0.0001). **Table II**. There was statistical significant intermediate negative correlation between GOLD grading and level of 25(OH) vitamin D in group I (r_s=-0.586, p=0.001).**Figure 1**. As regard BMI There was no statistical significant difference between the two groups. Also there was no statistically significant correlation between BMI and level of 25 (OH) vitamin D in both groups,in group I(r_s=0.017p=0.928).while in group II (r_s=-0.102 p=0.590). There was no statistically significant correlation between serum 25 (OH) vitamin D and GDS in both groups. In group I (r_s=0.152, p=0.423). While in group II: (r_s=-0.086 p=0.651). As regard smoking index, there was statistically significant intermediate negative correlation between smoking index and level of 25(OH)vitamin D in group I (**r_s**=-0.609, **p=**0.003).**Figure 2.** In addition there was statistically significant strong negative correlation between exacerbation frequency and level of 25(OH) vitamin D in group I (**r_s**=-0.829, **p**<0.001). **Figure 3.**

Table (1I): Serum 25 (OH) vitamin D level in the two studied groups:

Serum 25(OH) vitamin D level	Group I (n=30)		Group II (n=30)		Significance
	No.	%	No.	%	
Normal (20 – 80 ng/ml)	0	0.0	27	90.0	X^2=49.714 P<0.0001*
Mild to moderate deficiency (10-<20ng/ml)	18	60.0	3	10.0	
Sever (<10 ng/)	12	40.0	0	0.0	

*significant at P≤0.05

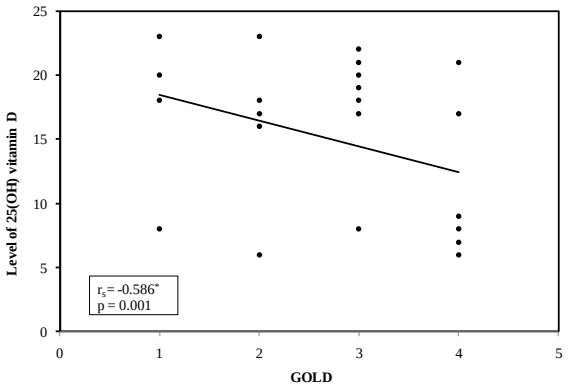

Figure 1: Correlation between GOLD grading and level of 25(OH) vitamin D in group I

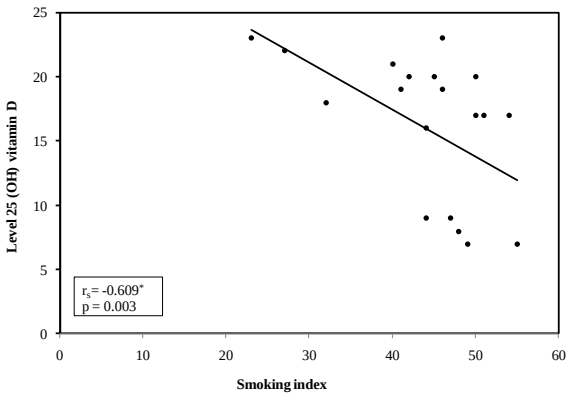

Figure 2: Correlation between Smoking index and level of 25(OH)vitamin D in group I

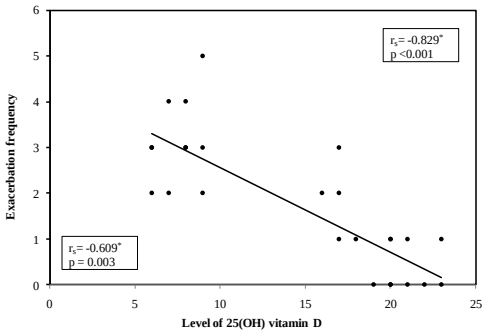

Figure 3: Correlation between exacerbation frequency and level of 25(OH)vitamin D in group1.

III. Discussion

There was no statistical significant difference between the two studied groups as regard demographic data including the mean age and gender distribution. In the current study, there was high prevalence of 25 (OH) vitamin D deficiency in COPD patients compared to controls. There was statistical significant difference between the two studied groups as regard 25(OH) vitamin D level Moreover, there was statistically significant strong negative correlation between level of 25(OH) vitamin D and GOLD grading in COPD patients. This coincides with Persson LJP et al who observed a high prevalence of vitamin D deficiency; 34% in the controls

and 20%, 43% and 55% in the patients with GOLD stage II-III-IV respectively [20].As regard BMI, it ranged from normal to overweight and obese in both groups and there was no statistical significant difference between the two studied groups. In addition there was no statistical significant correlation was found between BMI and 25 (OH) vitamin D in both groups, this mismatches with Taheri et.al [21] who found that there is a negative correlation between serum levels of 25(OH) D and BMI.Adiposity has in previous studies been a significant predictor of low levels of vitamin D in both COPD patients and subjects without COPD [20,22].. A suggested explanation for obesity-associated vitamin D insufficiency is a decreased bioavailability of 25(OH) D when deposited in body fat compartments [20].Season was a strong predictor of 25(OH)D levels, in our study sample subjects were examined during spring (March-April).Several studies showed the influence of season on the cutaneous photochemical synthesis of vitamin D3 [23]; maximal vitamin D3production occurs in summer months and, little or no vitamin D3 may be generated in winter months.

Our study demonstrated that smoking index was higher in COPD patient than controls and there was statistical significant difference between the two studied groups. Also there was statistically significant intermediate negative correlation between smoking index and 25 (OH) D levels in group I. This coincides with Eva N Kassi. The negative correlation between 25(OH) D levels and smoking could possibly be explained by alteration of cutaneous synthesis of vitamin D due to toxic effect of tobacco and also the fact that smoking is usually accompanied by a less healthy lifestyle (less physical activity, alcohol consumption and bad dietary habits) leading to reduced sun exposure and thus synthesis of vitamin D.[24] In line with our results, Jaaskelainen et al. studying 5741subjects (47% men) aged 30-79 years found that smokers had lower serum 25(OH)D concentrations than non-smokers.[25] In contrast, Scragg et al, found that smoking was not correlated with 25(OH)D levels,[26]Although some data suggest that low 25(OH)D levels are associated with an increased risk of respiratory infections, Ken M. Kunisaki et al ,found no relationship between baseline 25(OH)D levels and time to first acute exacerbation of COPD(AECOPD)[27]. The primary outcome used in this analysis was time to first AECOPD, but when the data were analyzed using exacerbation rates, the consistent result was that baseline 25(OH)Dhad no relationship to AECOPD. On the contrary our study showed that there was significant negative correlation between 25(OH) vit D level and exacerbation frequency. This may be explained by that Ken M. Kunisaki et al study was restricted to a single baseline assessment of 25 (OH)D levels.Several studies have found an increased prevalence of vitamin D deficiency in subjects with depression [28] or depressive symptoms. Vitamin D appears to be involved in the pathogenesis or prevention of depression. There is also emerging evidence of neuroprotective roles for vitamin D through antioxidant pathways, enhanced nerve conduction, neurotransmitter targets, neuronal calcium regulation, and effects on inflammation.[29] Emerging data suggest that elevated levels of proinflmmatory cytokines in the brain may be associated with depression.[30] In human studies, an inverse correlation was found between 25(OH)vitamin D status and inflammatory markers. Inflammation caused by increased cytokines can affect glial cell functions and damage neurons.[29]Depression may also be a risk factor for development of vitamin D deficiency. Depressed people may consume a less nutritious diet, stay indoors, and exercise less. Regular physical activity was also significantly associated with not having current symptoms of depression. However, in our study there was no statistical significant difference as regard GDS between the two studied groups. In addition, our data showed no correlation between depression and lower levels of 25(OH) vitamin D in COPD patients. This mismatched with MinhTu et al who found that low 25(OH) vitamin D levels are associated with depressive symptoms, especially in persons with a history of depression [31]. His findings suggest that primary care patients with a history of depression may be an important target for assessment of 25(OH) vitamin D levels.In our study, comorbidities were categorized according to Charleston score. Although there was statistical significant difference between the two groups,COPD patients were selected with the least comorbidities in this study.

IV. Conclusion

25(OH) vitamin D deficiency is highly prevalent in elderly COPD patients and it is correlated with the disease severity.

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