PREVALENCE OF VITAMIN D DEFICIENCY AMONG PATIENTS WITH OBSTRUCTIVE LUNG DISEASES (ASTHMA, COPD, BRONCHIECTASIS) IN SULAIMANI

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ABSTRACT

Background

Role of vitamin D in respiratory diseases is still need to be addressed. Literatures showed lower levels of vitamin D was associated with a reduction of lung function assessed by FEV1 and FVC in normal subjects.

Objectives

To assess the vitamin D level in patients with obstructive pulmonary diseases and matched controls, and to study the variability in vitamin D level with obstructive pulmonary disease characteristics.

Materials and Methods

A total of 102 cases with Obstructive Pulmonary Disease were enrolled and 127 healthy subjects as a control group. History taking, respiratory questionnaire, spirometry, chest CT scan and chest X-Ray had been used in the diagnosis. Patients with thyroid function disorder, vitamin D user, and bad compliance were excluded. Waters CE-Marks in Vitro Diagnostic Mass Trak Vitamin D Solution was used to determine the level of vitamin D in both groups. Lab values in ng/ml; Deficiency (<20 ng/ml), Insufficiency (20-29 ng\ml) and Sufficiency (30-100 ng\ml).

Results

All the data from both enrolled and control group were entered and analyzed using statistical package for social science (SPSS) version 20. From 102 cases two cases within normal value (1.7%), 88 cases (86.3%) Deficiency <20 ng/ml, 12 cases (11.8%) Insufficiency (20-29) ng/ml. Totally 100 cases (98.3 %) had low Vitamin D. The prevalence of low Vitamin D level in asthma was 96.3 %, Chronic Obstructive Pulmonary Disease 100%, and bronchiectasis 100 %. Both age and smoking habit had a statistically significant relationship with Vitamin D level.

Conclusion

The prevalence of low Vitamin D is very high in both patients and health group (98.3 % and 85.8%). Chronic ObstructivePulmonary Disease and bronchiectasis were 100% and asthma cases were 96.3%. Both age and smoking habit had a significant effect on Vitamin D level. Undiagnosed Chronic Obstructive Pumonary Disease was a big challenge in our study. We will recommend the parallel process of the diagnosis and screening for both ObstructivePulmonary Disease and Vitamin D level.

Keywords: *Vitamin D deficiency and insufficiency, Obstructive Pulmonary Diseases.*

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INTRODUCTION

Vitamin D (VD) is responsible for increasing intestinal absorption of calcium, magnesium, and phosphate. In humans, the most important compounds in this group are vitamin D3 (Cholecalciferol) and vitamin D2 (Ergocalciferol) [1].Vitamin D2 was chemically characterized in 1932 and in 1935, the chemical structure of vitamin D3 was established and proven to result from the ultraviolet irradiation of 7-dehydrocholesterol [2] and the first scientific description of a vitamin D-deficiency, namely rickets, was provided in the 17th century [1, 2]. Different institutions propose different recommendations concerning daily amounts of the vitamin D and it may not be sufficient if sunlight exposure is limited, 1 μg = 40 IU and 0.025 μg = 1 IU. The most advantageous serum levels for 25(OH)D for all outcomes appeared to be close to 30 ng/ml (75 nmol/L) [3]. The optimal vitamin D levels are still controversial and another review concluded that ranges from 30 to 40 ng/ml (75 to 100 nmol/L) [4]. Low blood calcifediol (25-hydroxyvitamin D) can result from avoiding the sun [5]. A study published in 2018 [6] recommended a beneficial dose of 30–50 ng/mL (75–125 nmol/L) for the overall healthy individual.

Vitamin D is currently of great public health interest, because of its deficiency is common and is causally associated with musculoskeletal diseases, multi organ dysfunctions and half of the world's population is affected by vitamin D insufficiency [7] and in Mayo Clinic published data in 2006 mentioned Vitamin D inadequacy has been reported in approximately 36% of otherwise healthy young adults and up to 57% of general medicine inpatients in the United States and in even higher percentages in Europe [8], contrast to this Vitamin D toxicity is rare and it has been observed in the related to the VD overdose [7, 8]. The role of VD in the course of respiratory diseases has been studied especially immune system- an inflammatory-related disease like allergic rhinitis [9, 10], asthma, COPD, asthma- COPD overlaps syndrome [11] and bronchiectasis. Hypovitaminosis D is associated with increased risk of cardiovascular disease, autoimmune disease, cancer, and allergy disease and here VD plays a significant role in the immune system of asthma which is directly affecting the adaptive immune system through its effects on Th1, Th2, and regulatory cells [12, 13].

Role of vitamin D in respiratory diseases is still needed to be addressed. However, the literature shows lower levels of vitamin D was associated with a reduction of lung function which was assessed by FEV1 and FVC in normal subjects. Vitamin D deficiency occurs frequently in COPD and correlates with severity of COPD. [11], but whether vitamin D deficiency has a higher prevalence in COPD patients compared to general population is not well documented. In addition, level of vitamin D in various combined COPD assessment stage has not been studied. In this study, we aimed to investigate the level of 25(OH)D.in common obstructive pulmonary diseases (OPD). Additionally, in order to have a complete view of the role of vitamin D in OPD, its correlation with clinical parameters was also investigated [14, 15].

MATERIALS AND METHODS

A case-control study that has been carried at Shar Teaching Hospital-Respiratory Unit, Sulaimani/Iraq, from May 2016 to October 2017. All the subjects are from Sulaimani governorate. The study was approved by the ethical committee of Kurdistan board for medical specialty (KBMS). 102 patients with obstructive lung diseases (asthma, COPD, bronchiectasis) were enrolled and 127 healthy subjects as a control group. History taking, respiratory questionaries, spirometry devices (from Care fusion and Mir Air), chest CT scan and chest X-Ray had been used in the diagnosis of obstructive pulmonary diseases. They have been informed and consent had been taken. Patients with thyroid function disorder, vitamin D user, and bad compliance were excluded. Shar Hospital laboratory, respiratory center, and the radiological department had been used. (Waters CE-Marks in Vitro Diagnostic Mass Trak Vitamin D Solution was used to determine the level of vitamin D level in both groups. Lab values: Deficiency (<20 ng/ml), Insufficiency (20-29 ng\ml) and Sufficiency (30-100 ng\ml).

All the data from both enrolled and control group were entered and analyzed using statistical package for social science(SPSS)version 20.

RESULTS

Control group were 127 healthy persons 48 male and 72 female their age range 16 to79 (42.9 ±15.06) 86 of them age (10-49), 41 of the aged between (50-85) with median age (67.7) as shown in table 1.

Among control group 80 of them have vitamin D deficiency (63%) and 29 are having insufficiency(22.8%), and 18 of them sufficient vitamin D level (14.2%),

mean vitamin D level among control group (19.8-12.9) in patient group vitamin D level was ranged (2.16 to 62.7) with median range (8.7), 88 patients were vitamin D deficient (86.3%) and 12 patients were vitamin D insufficient (11.8%) and only 2 patients were having sufficient vitamin D level (2%),the result is significant (P value <0.001), table 2.

In patient group (102) patients 47 were male, 53 were female their age was 15 to 85 ,control group were 127 healthy person 48 male and 72 female as shown in table 3.

Mean of vitamin D level among obstructive pulmonary disease patients is (10.4 ± 8.2) median (8.7) and mode (3) while among control group mean is (19.8 ± 12.9) and median is (16.6) as shown in table 4.

Vitamin D deficiency was present among 63% of control group while it was 86,3% among diseased group,insufficiency was 22.8% among control group while it was 11.8% among diseased group14.2% of control group were have sufficient vitamin D level, with 2% of diseased group as shown in table 5.

About body weight of the patient group, Underweight (<18.5) were 2 patients (%2), normal BMI (18.5-24.9) were 43 (42.2%) overweight (25-29.9) were 34 patients (33.3), and obese patients were (22.5%).among. underweight 2% were VD defiant and 43% of normal BMI level were defiant VD, %33.3 of overweight were deficient and lastly, only 22% of obese were having VD deficiency. The highest number of deficiency was observed among overweight patients and lowest number was observed among underweight. With significant result (P value <0.007), table 6.

Age differentiation between two groups, from 10-49 years, control group significantly younger 86 % and about 55 % for each, but 50 to 85 years there was no significant different almost the same alder.

Patient group were 102 patients,55 of them were asthmatic (53.9%), COPD 34 patients (33.3%) and bronchiectasis 13 patients (12.7%).Vitamin D Deficiency had the highest percentage of patient with asthma and lowest among patient with bronchiectasis as shown in table 7. Totally 100 cases (98.3 %) had low VD. The prevalence of low VD level in asthma was 96.3 %, COPD 100%, and bronchiectasis 100 %. Both age and smoking habit had a statistically significant relationship with VD level.

Table 1. Shows the distribution of age among the groups.

Age/ ranges(year)	**Mean ± SD (year)**		**Median**	**Groups**
15 to 85	48 ±14.5		45.5	Cases with OPD (N* = 102)
16 to 79	42.9 ±15.06		44	Control group (N* = 127)
Age groups (year)	**Frequency**		**Percent (%)**	
	Cases with OPD (Nr. 102)	**The control group (Nr. 127)**	**Cases with OPD (Nr. 102)**	**The control group (Nr. 127)**
10 - 49	56	86	54,9	67.7
50 - 85	46	41	44,1	42.2
Total	102	127	100	100

Table 2. Relation of the age distributions and VD levels.

Age (year)	Vitamin D level (ng/ml)						Total		P-value	
	Deficiency (<20)		Insufficiency (20-29)		Sufficient (30-100)					
	Cases (N*=102)	Control (N* =127)	Cases (N* = 102)	Control (N* = 127)	Cases (N* = 102)	Control (N* = 127)	Cases (N* =102)	Control (N* = 127)	Cases (N* = 102)	Control (N* =127)
10-19	4	4	0	2	0	2	4	8		
20-29	5	11	3	6	0	4	8	21		
30-39	15	14	1	7	1	3	17	24		
40-49	23	21	4	8	0	4	27	33		
50-59	18	17	2	4	1	2	21	23	<0.001	<0.001
60-69	14	9	2	2	0	2	16	13		
70-79	8	4	0	0	0	1	8	5		
80-85	1	0	0	0	0	0	1	0		
Total	88	80	12	29	2	18	102	127		

Table 3. Shows the distribution of gender among the groups.

Gender	Frequency		Percent	
	Cases with OPD (N*= 102)	Control group (N*= 127)	Cases with OPD (N* = 102)	Control group (N* = 127)
Male	47	48	46.1	37.8
Female	53	72	52	56.7
Total	100 (M:F** ratio = 0.89)	120 (M:F**ratio = 0.67)	98	94.5

Table 4. Shows the distribution (mean ±SD, range, median, and mode) of VD levels among. the groups.

Vitamin D levels	Mean ± SD	Range	Median	Mode
Cases with OPD (Nr. 102)	10.4 ± 8.2	2.16 to 62.7	8.7	3
Control group (Nr. 127)	19.8 ± 12.9	4.2 to 82	16.6	16.3

Table 5. Shows the distribution of VD levels between the two groups.

Vitamin D level (ng/ml)	Frequency		Percent	
	Cases with OPD (Nr. 102)	The control group (Nr. 127)	Cases with OPD (Nr. 102)	The control group (Nr. 127)
Deficiency (<20)	88	80	86.3	63
Insufficiency (20-29)	12	29	11.8	22.8
Sufficiency (30-100)	2	18	2	14.2
Total	102	127	100	100

Table 6. Shows relationship between body weight and VD.

Body mass index (BMI - kg/m2)	Vitamin D level (ng/ml)			Total	P-value
	Deficiency (<20)	Insufficiency (20-29)	Sufficiency (30-100)		
Underweight (<18.5)	2	0	0	2 (2%)	
Normal weight (18.5-24.9)	42	1	0	43 (42,4%)	
Overweight (25-29.9)	29	4	1	34 (33,3%)	<0.001
Obese (≥30)	15	7	1	23 (22,5)	
Total	88	12	2	102 (100%)	

Table 7. Shows relationship between OPD and VD level.

Types of the disease	Vitamin D level (ng/ml)			Total	P-value
	Deficiency (<20)	Insufficiency (20-29)	Sufficiency (30-100)		
Asthma	47 (46%)	6 (5.9%)	2 (2%)	55 (53.9%)	
COPD	31 (30.4%)	3 (2.9%)	0 (0%)	34 (33.3%)	<0.001
Bronchiectasis	10 (9.8%)	3 (2.9%)	0 (0%)	13 (12.7%)	
Total	88 (86.3%)	12(11.8%)	2 (2%)	102 (100%)	

DISCUSSIONS

To our knowledge, this is the first trial to study the relationship or the role of Vitamin-D in OPD (asthma, COPD, and Bronchiectasis) in Iraq and Kurdistan, searching the online database. OPD is a common undiagnosed [15, 16] disease and VD undernutrition has not been studied well in this group of patients and still some area of respiratory medicine need to be addressed and studied, but at the last years both asthma and COPD has got interesting in Kurdistan and Iraq. Our study is a part of this enlightening. COPD under-diagnosis and misdiagnosis is very high in the world and the role of vitamin D (VD) in respiratory medicine is needed to be studied at the time of diagnosis and screening for OPD.

It is estimated that one billion people worldwide are deficient in Vitamin-D and obstructive pulmonary diseases itself is underdiagnosed and undiagnosed OPD is common across the world the researchers identified that 81.4% of COPD cases went undiagnosed by a physician with the highest rate occurring in Ile-Ife, Nigeria (98.3%)[17]. Early detection of COPD is still an unresolved issue as shown in a Spanish study [18] with the prevalence of COPD 10.2% in Spain, with a large proportion of undiagnosed disease.

The results of our study demonstrated a very high percentage (85.6%) of the normal population has low VD, deficiency and insufficiency, and about 98.3 % of enrolled cases with OPD. 102 patients with obstructive pulmonary diseases(OPD) were enrolled in the study.

The prevalence of low VD level in asthma is 53 of 55, it means 96.3% and (51.9 % of all cases), COPD 34 of 34 it means 100% and (33.4 % of all cases) and bronchiectasis 13 of 13 it means 100 % and (12.7% of all cases).A similar result has been presentedrecently [19], with a high prevalence of vitamin D deficiency in patients with COPD (98.4%) and 83.6% of patients have reduced levels of vitamin D in other paper [20], and in Tunisian study [21], clinical impact of vitamin D deficiency on Tunisian asthmatics, they showed that of the total 92% had low VD and 7% had normal serum concentration of vitamin D. From a total of 102 cases just two cases within normal value (1.7%), 88 cases (86.3%) were Deficiency <20 ng/ml, 12 cases (11.8%) were Insufficiency (20-29) ng/ml. Totally 100 cases (98.3 %) had low VD and this will increase more awareness of the importance of vitamin D for the maintenance of general immune and respiratory health [22] and affects both children and adults. Age observation among asthma in our study showed the nonsignificant difference between ages in low VD level; the age of 10 to 29 years 12 cases (100%) they had low VD level, but only one case from the age 30 to 49 was within normal value and the results were the same for older age.Our results showed that VD undernutrition equally affects all ages whose are suffering from OPD (asthma, COPD, and Bronchiectasis). Thorax published in 2013a study about bronchiectasis[23] showed 50% of bronchiectasis patients were Vitamin-D deficient, 43% insufficient and only 7% sufficient. Concerning COPD an Italian-Sweden study [24] they found Vitamin D deficiency in almost all the patients during exacerbations and more than 30 % was severe (<10 ng/ml). In the control group of 127 healthy subjects from16 to 79 years, VD deficiency 63%, VD insufficiency 22.8% and VD sufficient 14.2 %, totally 85.8 % vs 98.3% for OPD group. There was a statistically very highly significant relationship between body weight and VD in the OPD group. VD deficiency and insufficiency were higher among normal and overweight cases. Age, smoking: Smoking habit 52 of 55 asthma cases were a nonsmoker, for COPD just two of them were a nonsmoker and for bronchiectasis 7 non-smoker and the rest either x- smoker or current smoker. In our study, both age and smoking habit had a significant effect on VD level Allergy demonstration, 67 cases (63.7%) had no allergy and the rest of the cases had some sort of allergic experiences, most of them seasonal allergy 12.7 % and they were young asthmatics.

Our study faced some limitations like economic crisis in Kurdistan/Iraq and prices of VD tests and we have not got through factum or evidence-based medicine about asthma, COPD, and bronchiectasis. We have limited our research to the prevalence of VD in OPD and a control group. Sometime the methodology of the health system in the Middle East will put some obstacles and limitations especially time concerning for both patient and physicians.

In Conclusions, the prevalence of low VD level varies from country to country, mainly because of the deficit in sun exposure and changes in lifestyle. The prevalence of VD deficiency and insufficiency is very high in our study in both patients and health group (98.3 % and 85.8%). All patients with COPD and bronchiectasis have 100% low VD level, asthma patients have 96.3% low VD level. Both age and smoking habit had no significant effect on VD level in our study. Low VD level is very high in a healthy population also (85.6). Undiagnosed COPD is a big challenge for the treatment and diagnosis

of VD undernutrition. We will recommend the process of diagnosis and screening for both OPD and VD level should be paralleled performed.

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Competing interests

The authors do not have any conflict of interest.

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