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Association between vitamin D level and severity of backache in a sample of patients in Kirkuk city, Iraq.

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ABSTRACT

***Background and objectives**: Vitamin D deficiency and LBP are well documented in Kirkuk city; henceforth it would be appropriate to evaluate the association between vitamin D deficiency and severity of low back pain.*

***Methods**: A cross-sectional descriptive hospital based study was done in Kirkuk general hospital, located in Kirkuk city, Iraq; during a one year period starting from the 1st of June 2018 and ending on the 31st of June 2019. Total of (100) patients having low back pain (LBP) were included by non-probability consecutive sampling. Demographic information included in the questionnaire [age, gender, body mass index (BMI), education level, marital status, and occupation]. Patients were divided into two groups as Vitamin D deficient (Group 1) with a Vitamin D level below 20 ng/mL and normal (Group 2) with a value above 20 ng/ml.*

***Results**: Hundred patients with backache participated in the study. Their mean age ± SD was 45.01 ± 14.76 years. The deficiency of vitamin D was detected in (83%) of the patients, while Vitamin D was found in (17%) as normal. No significant association was detected between vitamin D deficiency with gender ($p = 0.110$), BMI ($p = 0.672$), educational level ($p = 0.598$), and marital status ($p = 0.357$); however, there was a statistically significant difference between the two groups in terms of VAS score and levels of Vitamin (D), since the highest mean of vit.D (27.96) was among patients with mild backache which was significantly higher than the mean among those with severe backache (14.27) or very severe backache (13.68).*

***Conclusion**: Our study revealed a connection between Vitamin D deficiency and the severity of the pain in patients with LBP. Vitamin D levels screening in individuals with LBP should be taken into consideration because of the cheap, safe, treatable form of the symptoms for clinicians.*

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Introduction

low back pain (LBP) defined as Pain localized to (the region located inferior to the lower costal margins and superior to the inferior gluteal folds) there is consensus internationally on this definition.(1,2) Vitamin D refers to a group of fat-soluble steroids of which vitamin D2(ergocalciferol) and vitamin D3(cholecalciferol) are the most important active compounds of the vitamin D group in human. 25hydroxyvitamin D (25(OH)D) is the most commonly measured metabolite because of its 1000-fold higher serum concentrations and greater half-life of around 3 weeks as compared to the physiologically active metabolite 1,25-dihydroxyvitamin D having half-life of few hours (3). Vitamin D controls calcium homeostasis and metabolism (4). Additionally, it is involved in bone formation, resorption and mineralization, and maintains neuromuscular function (4). Vitamin D is also implicated in regulating inflammatory cytokine synthesis (4). Back ache is ((one of the common symptoms everywhere in the world and everybody does experience it sometime in life time)) (5). Evidence has linked low levels of vitamin D with higher incidence of chronic pain (6). It is well established that low vitamin D levels lead to osteomalacia resulting in bony pains (7). However, no clear biological mechanism is postulated for causally relating its low levels with other varieties of chronic pain.

In our country also, the deficiency or insufficiency of Vitamin D has appeared more and more in the recent period, with increasing opportunities and availability of healthcare. In some sources, the deficiency of Vitamin D is now considered as a global epidemic.[8]. The level of serum 25-hydroxyvitamin D (25(OH)D) should be measured to assess the Vitamin D status. It is accepted that if the level of serum 25(OH)D is>30ng/mL, the level of Vitamin D is adequate; if it is 20–30 ng/mL, there is Vitamin D deficiency; if it is <20 ng/mL, there is lack of Vitamin D; and if it is <10 ng/mL, there is a serious lack of Vitamin D. Due to the low number of foods containing Vitamin D, a small proportion (10%–

20%) of this vitamin is consumed with food. A significant portion (80%–90%) is synthesized in the skin by ultraviolet B rays. For synthesis, direct sunlight contact is required on the skin. The angle of sunlight reaching the earth's surface is effective in the synthesis of Vitamin D. At the geographic latitudinal of the earth, the synthesis of Vitamin D takes place between May and November Since the appropriate beam angle is between 10.00 A.M and 03.00 P.M, it is advisable to go out in the sun at these times for the synthesis of Vitamin D. If the whole body is exposed to sunlight and appears light pink color at appropriate times during summer, about 20,000IU Vitamin D synthesis occurs at an equivalent level to the dose of Vitamin D. [8, 9].

The relation between low back pain and vitamin D deficiency could be due to two possible reasons, 1st possible reason is that vitamin D deficiency in low back pain patients causes diffuse pain in bone and muscle, parasthesia with weakness. [10, 11]

Second reason may be due to decreased levels of vitamin D causes decrease in anti-inflammatory cytokines and increase in pro-inflammatory cytokines which leads to increased chances of vertebral end plates inflammation. [11, 12, 13].

Extensive literature search revealed no published systematic review and meta-analysis that provides a comprehensive review about quantification of prevalence of vitamin D deficiency in individuals with low back pain (LBP).

Thus, the present study is planned to aggregate evidence on the relationship between vitamin D deficiency and LBP. This evidence generation may provide a useful guide for the planning of future studies and public health policies for prevention and treatment of vitamin D deficiency in LBP patients.

Patients and methods

A hospital based descriptive cross-sectional study was carried out in Kirkuk general hospital, located in Kirkuk city, Iraq; during a one year period starting from the 1st of June 2018 and ending on the 31st of June 2019.

A total of one hundred consecutive patients aged between (16-80) years

complaining of lower back pain (LPB) of idiopathic in nature were examined. A questionnaire designed by the researcher was used for data collection and recording, all subjects' undergone thorough clinical examination. The demographic parameters including age, gender, body mass index (BMI), education level, marital status, and occupation were recorded, Visual Analog pain scale (VAS) (0–10 cm; 0 = no pain, 10 = worst pain) was used to evaluate the state of pain.

MRI of lumbosacral spine were performed to exclude prolapsed disc and spinal canal narrowing when needed, Patients who admitted to our outpatient clinic with LBP were divided into two groups as Vitamin D deficient (Group 1) with a Vitamin D level below 20 ng/mL and normal (Group 2) with a value above 20 ng/ml. Venous sampling 5 ml was done for serum 25- hydroxy cholecalciferol (vit. D3), it is measured by immunoassay analyzer (Cobas e411). Measurements of weight and height were carried out for all patients, The weight (in kg) was divided by the height(meter) and then squared to calculate the body mass index(BMI).

Method of collection of data

Inclusion criteria

Patients whose Pain has been defined, vitamin D levels have been determined in ng/ml.

Exclusion criteria before work

Those who complaining of a pathological etiology for the lower backache or those with clinical features suggestive of neurologic etiology were excluded, Patients with history of chronic hepatic disease, renal impairment, trauma, infection, tumors, endocrinological, neurological and rheumatological diseases were excluded. Patients who are followed up with osteomalacia diagnosis, Patients with advanced osteoporosis and compression fracture in X-ray, patients with metabolic bone diseases, lactating and pregnant women were excluded from this study.

Statistical analysis

Using the Statistical Package for Social Sciences (SPSS, version 22) to analyze

Data, to compare proportions Chi square test of association was used. (Fisher's exact test was used when the expected count of more than 20% of the cells of the table was less than 5). One way analysis of variance (ANOVA) was used to compare three means. A post hoc test (LSD) was used to compare means of each two groups (after doing the ANOVA test). Spearman rho correlation efficient was calculated to assess the strength of correlation between the VAS scores and the vitamin D level. A p value of ≤ 0.05 was considered statistically significant.

RESULTS

Hundred patients with backache participated in the study. Their mean age ± SD was 45.01 ± 14.76 years, ranging from 17 to 74 years. The median was 46.5 years.

Table 1 show that the largest proportion (25%) of patients aged 40-49 years, and only 17% aged ≥ 60 years. Around two thirds of the patients (64.0%) were females. The table shows that a considerable proportion of the sample were illiterate (25%) or primary school graduates (28%). The majority (58%) of the sample was unemployed / housewives, and three quarters were married. It is evident in the table that 57% of the sample was over-weight and 12% were obese.

Table 1. Basic characteristics of the study sample.

	No.	(%)
Age (years)		
< 30	19	(19.0)
30-39	19	(19.0)
40-49	25	(25.0)
50-59	20	(20.0)
≥ 60	17	(17.0)
Gender		
Male	36	(36.0)
Female	64	(64.0)
Educational level		
Illiterate	25	(25.0)
Primary	28	(28.0)
Intermediate	23	(23.0)
High school	16	(16.0)
College	8	(8.0)
Occupation		
Unemployed	58	(58.0)
Manual work	10	(10.0)
Office work	21	(21.0)
Retired	11	(11.0)
Marital status		
Married	75	(75.0)
Unmarried	25	(25.0)
BMI categories (Kg/m^2)		
<25	31	(31.0)
25-29.9	57	(57.0)
≥ 30	12	(12.0)
Total	100	(100.0)

Table 2 shows that the more the severity of backache, the more the proportion of patients with vitamin D deficiency. The table shows that 94.7% of those with severe backache had vitamin D deficiency compared with 56% among those with mild backache (p <0.001).

Table 2. Vitamin D level by severity of backache.

	Vitamin D level						
	Deficient		Normal		Total		
Severity of backache	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**p**
Mild	14	(56.0)	11	(44.0)	25	(100.0)	
Severe	51	(91.1)	5	(8.9)	56	(100.0)	
Very severe	18	(94.7)	1	(5.3)	19	(100.0)	< 0.001*
Total	83	(83.0)	17	(17.0)	100		

*By Fisher's exact test.

Table 3 shows that the highest mean of vitamin D (27.96) was among patients with mild backache which was significantly higher than the mean among those with severe backache (14.27) or very severe backache (13.68).

Table 3. Means of vitamin D levels by severity of backache.

Severity of backache	N	Mean vitamin D	(±SD)	p (ANOVA)	LSD (groups)	p (LSD)
A) Mild	25	27.96	(±22.7)	0.001	A X B	< 0.001
B) Severe	56	14.27	(±12.3)		A X C	0.003
C) Very severe	19	13.68	(±10.1)		B X C	0.886
Total	100	17.58	(±16.2)			

Table 4 shows that 47.1% of those aged ≥ 60 years had vitamin D deficiency which was significantly lower than the proportions among those of other age groups (p = 0.001). No significant association was detected between vitamin D deficiency with gender (p = 0.110), BMI (p = 0.672), educational level (p = 0.598), and marital status (p = 0.357). Regarding the occupation, 36.4% of the retired patients had vitamin D

deficiency which was significantly lower than the proportions in the other categories of occupation (p = 0.001).

Table 4. Vitamin D level by the studied factors.

	Vitamin D level						
	Deficient		Normal		Total		p
	No.	(%)	No.	(%)	No.	(%)	
Age (years)							
< 30	18	(94.7)	1	(5.3)	19	(100.0)	
30-39	18	(94.7)	1	(5.3)	19	(100.0)	
40-49	21	(84.0)	4	(16.0)	25	(100.0)	
50-59	18	(90.0)	2	(10.0)	20	(100.0)	
≥ 60	8	(47.1)	9	(52.9)	17	(100.0)	0.001*
Gender							
Male	27	(75.0)	9	(25.0)	36	(100.0)	
Female	56	(87.5)	8	(12.5)	64	(100.0)	0.110
BMI categories (Kg/m^2)							
<25	25	(78.1)	7	(21.9)	32	(100.0)	
25-29.9	52	(85.2)	9	(14.8)	61	(100.0)	
≥ 30	6	(85.7)	1	(14.3)	7	(100.0)	0.672
Educational level							
Illiterate	22	(88.0)	3	(12.0)	25	(100.0)	
Primary	24	(85.7)	4	(14.3)	28	(100.0)	
Intermediate	19	(82.6)	4	(17.4)	23	(100.0)	
High school	11	(68.8)	5	(31.3)	16	(100.0)	
College	7	(87.5)	1	(12.5)	8	(100.0)	0.598*
Marital status							
Married	64	(85.3)	11	(14.7)	75	(100.0)	
Unmarried	19	(76.0)	6	(24.0)	25	(100.0)	0.357*
Occupation							
Unemployed	52	(89.7)	6	(10.3)	58	(100.0)	
Manual work	10	(100.0)	0	(0.0)	10	(100.0)	
Office work	17	(81.0)	4	(19.0)	21	(100.0)	
Retired	4	(36.4)	7	(63.6)	11	(100.0)	0.001*
Total	83	(83.0)	17	(17.0)	100		

*By Fisher's exact test.

Negative significant correlation was detected between the VAS scores and vitamin D levels (rho = -0.597, p <0.001) as presented in Figure 1.

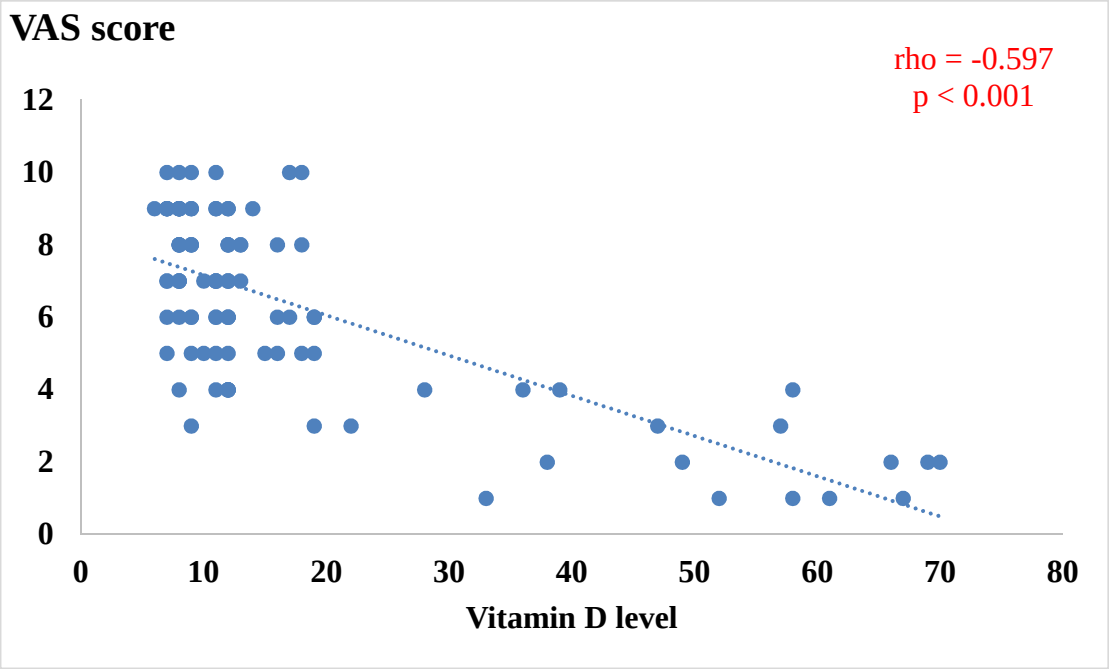

Figure 1. Correlation between VAS score and vitamin D level.

Discussion

In our study, we investigated the relationship between the severity of pain and the level of Vitamin D in patients with LBP and those who applied to the pain clinic. LBP and lack of vitamins are the most common health problems in our country and all over the world. The synthesis of >80% of Vitamin D in the body occurs under the influence of sunlight. Vitamin D, taken with foods, does not have a significant contribution, especially after a supplement is not taken. Seasonal and geographical changes are inevitable in the synthesis of Vitamin D in the derailment as the primary source is sunlight [14-16], The data we obtained showed that most patients with LBP had a deficiency of Vitamin D and that 83 % of patients with low backache had vitamin D levels lower than 20 ng/dL (deficient group). Similarly a Saudi Arabia study of chronic LBP patients revealed 83% of low back pain patients had vitamin D deficiency [17]. Also a study by Siddique & Malik on low back pain patients in Islamabad revealed that 81% of patients having sub-optimal levels of vitamin D [18]. Similar results are also found all around the globe [19-21]. In obese patients' body mass index(BMI) is a risk factor for vitamin-D deficiency because of an increase in adipose tissue leads to distribution and dispersion of this fat-soluble vitamin

and thus reduction in its bioavailability [22). Most of studies suggesting an inverse relationship between the serum vitamin D levels and body mass index(BMI) (23,24). However, several clinical studies have also indicate a high prevalence of vitamin D level deficiency in non-obese patients [25), by our study, there was no significant correlation between the 25(OH) D serum level and body mass index(BMI) (p = 0.672); this findings was agree with the results of study done by Kim et al. [26].

When we performed literature review, there were few studies investigating the relationship between D vitamin and pain severity. In some studies, there was a significant correlation between serum 25(OH)D and pain severity.[27] However, in some studies, serum 25(OH)D and pain severity were not significantly correlated.[28,29] Considering these conflicting findings, careful evaluation of Vitamin D supplementation is required, in our study there is significant relationship between D vitamin and pain severity since the more the severity of backache, the more the proportion of patients with vitamin D deficiency, also it shows that 94.7% of those with severe backache had vitamin D deficiency compared with 56% among those with mild backache (p <0.001).

Recommendations

It is recommended to increase the sun exposure to correct vitamin D deficiency. It is calculated that solar exposure of as short as 11 minutes, in around 15% of the body surface on most days, can produce about 1000 IU/day of vitamin D3 (34). Vitamin D supplementation may be another way to ensure an adequate vitamin D status when there is no adequate sun exposure.

Limitations of the study

The most important limitation of our study is a retrospective study. It is also not possible to generalize the outcome because the study group population was selected from patients with LBP who had applied to the pain clinic.

Conclusion

Vitamin-D deficiency is occurs in most of patients complaining of low back

pain(LBP) and should be considered as one of the contributing factors in individuals with idiopathic lower backache.

Conflicts of interest

There are no conflicts of interest.

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