

# PREVALENCE OF VITAMIN D DEFICIENCY IN DIABETIC PATIENTS

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## ABSTRACT

### *Background*

There are increasing incidence of diabetes around the worldwide, and there are a lot of studies have been considering vitamin D's role in the incidence, and improving glucose status in diabetes.

### *Objectives*

This study is done to evaluate the prevalence of vitamin D deficiency in diabetic patients in Sulaimani Diabetes and Endocrine Center.

### *Materials and Methods*

This is a case-control study done on 100 diabetic patients compared to 100 persons in the general population in Sulaimani/Iraq. Their Vitamin D was estimated from June 1<sup>st</sup>, 2017 to December 1<sup>st</sup>, 2017.

### *Results*

Results: The mean age of the diabetic group was (49.68 yr.  $\pm$  8.64 SD), and the mean age of the non-diabetic group was (50.49 yr.  $\pm$  6.78 SD). The mean vitamin D's level in the diabetic group was (16.91 ng/dl  $\pm$  5.5 SD) and in a non-diabetic group was (16.21 ng/dl  $\pm$  8.59) (P-values= 0.493). Among diabetic group vitamin D level is significantly higher in males with an average of 6.2 ng/dl in comparison to females, (P-Value = 0.024), among diabetic patients, Vitamin D level was deficient in (66%), insufficient in (19%) and was sufficient just in (15%), while in non-diabetic control group vitamin D level was deficient in (77%), insufficient in (20%) and sufficient just in (3%). The P-value for these differences is (0.0052).

### *Conclusion*

The results of this study show the majority of our participants have suboptimal vitamin D level. Vitamin D level was lower in female patients in comparison to male patients.

**Keywords:** *Diabetes Mellitus (DM), Vitamin D deficiency, Serum Vitamin D.*

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## INTRODUCTION

Diabetes mellitus (DM) has become one of a large public health problem, affecting more than 300 million individuals in the world, with significant complications worldwide <sup>(1)</sup> with the increasing number of patients with DM all over the world. It is expected that this disorder will be a reason for significant morbidity and mortality <sup>(2)</sup>.

Due to lifestyle changes and amount of food intake after the discovery of oil in the 1950s in Arabian Gulf countries the numbers of diabetes and metabolic syndrome are increasing at an alarming rate <sup>(3,4)</sup>.

Vitamin D inadequacy constitutes a largely unrecognized epidemic in many populations worldwide, postmenopausal <sup>(5,6)</sup>, persistent non-specific musculoskeletal pain <sup>(7)</sup>, primary hyperparathyroidism in female patients <sup>(8)</sup>, hip fracture in elderly females <sup>(9)</sup>, osteoarthritis in postmenopausal females <sup>(10)</sup>, secondary hyperparathyroidism <sup>(11)</sup>, minimal trauma causing fracture <sup>(12)</sup> and osteoporosis <sup>(13)</sup>. A study done in Karballa/Iraq showed that vitamin D insufficiency and deficiency was highly prevalent in postmenopausal women which was more than (85%), women of child-bearing age was more than (65%), young men aged between (25-49) years was more than (60%) and men aged between (50-70) years was about (82%) <sup>(14)</sup>.

Despite musculoskeletal defects, low vitamin D is related to some non-skeletal disorders such as malignancy, autoimmune diseases, hypertension, endothelial dysfunction, dyslipidemia, infections, and cardiovascular disease <sup>(15)</sup>.

More recently, many studies were done to prove the effect of vitamin D deficiency and calcium status in the development of type 2 DM <sup>(16,17)</sup>, most of them may have a role <sup>(18-21)</sup>, but not all of them <sup>(22,33)</sup>.

In recent years, studies have done showed that using vitamin D can help to decrease the incidence of diabetes mellitus and adjustment of insulin and glucose <sup>(23-27)</sup>. Surveys showed that using supplements of vitamin D with calcium will significantly decrease fasting blood glucose level <sup>(28)</sup>. So, using vitamin D supplements alone can prevent type-1 diabetes incidence <sup>(29)</sup>.

There is no survey showing prevalence of vitamin D deficiency in diabetic patients in our region, this study is done to evaluate prevalence and vitamin D status in diabetic patients.

## PATIENTS AND METHODS

This is a case-control study done in Sulaimani city. Hundred patients with type 2 diabetes mellitus, randomly selected in Sulaimani Diabetes and Endocrine Center to evaluate vitamin D level from June 1<sup>st</sup>, 2017 to December 1<sup>st</sup>, 2017, after they had agreed to participate in this study with inclusion criteria. The diabetic patients with renal insufficiency and who received vitamin D supplement are excluded and set as a case group. The control group selected from the general population matched with gender and sex to case group.

Serum vitamin D sent for all the patients and a case group fasting blood sugar, HbA1c, renal function and lipid profile was evaluated for diabetic group, due to seasonal change effect on vitamin D, all vitamin D was collected in one season. Vitamin D was measured with Cobas electrochemiluminescence immunoassay (ECLIA) on Cobas e411. Vitamin D was defined:

- Deficient when serum 25-hydroxyvitamin D is less than 20 ng/ml.
- Insufficient when serum 25-hydroxyvitamin D is between 20-30 ng/ml.
- Sufficient when serum 25-hydroxyvitamin D is concentration higher than 30 ng/dl (30).

### Statistical analysis

Vitamin D level was dealt with as an independent variable and HbA1c, fasting blood sugar, lipid profile, Body Mass Index was dealt with as dependent variables in the statistical analysis. Data management and analysis were performed utilizing Statistical Package for Social Sciences (SPSS) software, version 24.

This study was done on human participants. All data were kept in a secure and confidential manner. All participants' identification and associated data were separated. All data were analyzed as total population in a manner that individual privacy was maintained. All records, results and progress, both electronic and composed will be kept with the researchers in case of review.

A written informed consent was taken from the participants clarifying the aim of the study, the importance of the respondents' views, the researcher's name.

## RESULTS

## Prevalence of Vitamin D Deficiency in Diabetic Patients

In this study, one hundred (100) patients with Diabetes Mellitus had been screened for vitamin D deficiency, and they were compared to (100) non-diabetic individuals randomly selected from the general population set as the control group.

Both groups are well matched in terms of age (patients with type 2 diabetes mean Age: 49.68 yr.  $\pm$  8.64 SD vs. Non-diabetics mean Age: 50.49 yrs.  $\pm$ 6.78 SD), P-Value (0.461), that is no significant difference in age. The same for gender (diabetics; 33% male, 67% female), control (39% male, 61% female), P-Value: (0.465).

The mean concentration of vitamin D in diabetic group was (16.91 ng/dl  $\pm$  5.5 SD) and in non-diabetic patients was (16.21 ng/dl  $\pm$ 8.59 SD) (P-values= 0.493).

Among the diabetic group, vitamin D level is significantly higher in males by an average of 6.2 ng/dl in comparison to females, (p-Value: 0.024). While this difference is not present in non-diabetics (male 16.98 $\pm$ 5.02 Vs. female 16.87 $\pm$ 5.82). (P-Value = 0.12), Table 1.

Among diabetic patients, Vitamin D level was deficient in (66%) and insufficient in (19%) and was sufficient in (15%), while in the non-diabetic control group, vitamin D level was deficient in (77%), insufficient in (20%), and sufficient in (3%). The P-Value for these differences is (0.0052). Figure 1.

Among diabetic group, rate of deficiency was higher in females, 75% of females were deficient (n=50), (15%) (n=10) were insufficient, and (10%) (n=7) were sufficient. While male patients had (48%) rate of deficiency (n=16), (27%) (n=9) were insufficient and (25%) (n=8) were sufficient. The p-value is (0.056), Table 2.

A weak negative correlation between serum vitamin D level and HbA1C% was found by a factor of (- 0.182) and the P-value for this correlation is 0.06.

Also, the negligible correlation between serum Vitamin D level and BMI was found by a factor of (- 0.018) and the P-value for this correlation is 0.8.

**Table 1. The Case and control group's mean age with vitamin D levels**

	<b>Diabetic group</b>	<b>Non-diabetic group</b>	<b>P value</b>
<b>Mean Vitamin D</b>	16.91 $\pm$ 5.5 SD	16.21 $\pm$ 8.59 SD	0.493
<b>Mean Age</b>	49.68 yrs. $\pm$ 8.64 SD)	50.49 yrs. $\pm$ 6.78 SD	0.461
<b>Male(n)</b>	33	39	0.465
<b>Female (n)</b>	67	61	
<b>Male Vitamin D</b>	22.40 $\pm$ 10.73	16.98 $\pm$ 5.02	p-value 0.12
<b>Female Vitamin D</b>	16.21 $\pm$ 8.59	16.87 $\pm$ 5.82	

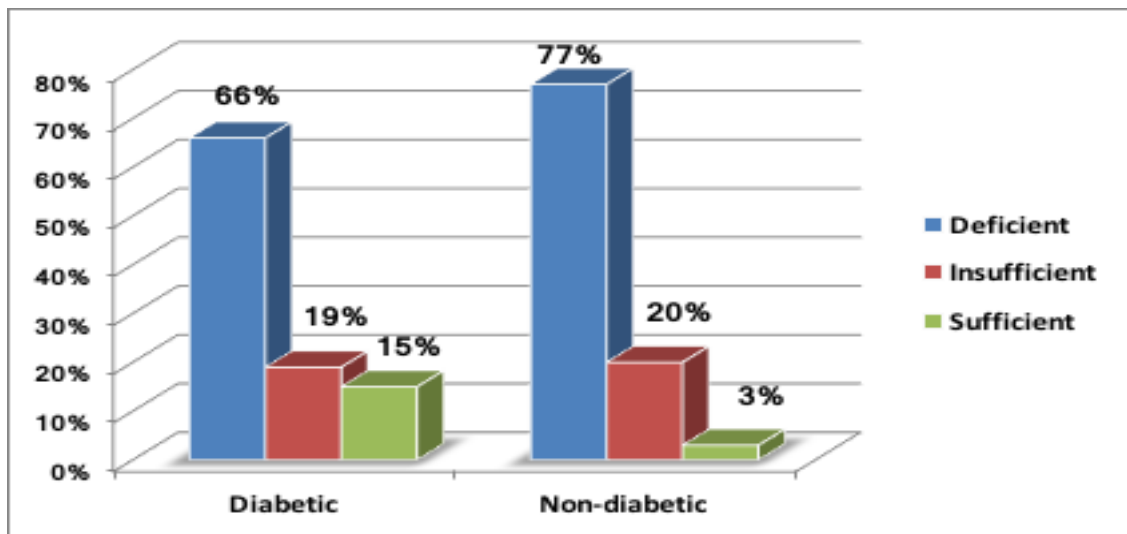


Figure 1. Prevalence of vitamin D deficiency in the diabetic and non-diabetic group.

Table 2. Vitamin D deficiency in diabetic according to Gender.

	Females	Males	P-Value
<b>Deficient</b>	50 (75%)	16 (48%)	0.056
<b>Insufficient</b>	10 (15%)	9 (27%)	
<b>Sufficient</b>	7 (10%)	8 (25%)	
<b>Total (n)</b>	67(100%)	33 (100)	

## DISCUSSION

The result of this study shows a very high prevalence of vitamin D deficiency in both diabetic and non-diabetic group but the mean vitamin D level in both groups was near to each other (P-value was 0.493) which is considered not a significant difference between diabetic and non-diabetic. In other studies done in Iran and Saudi Arabia, there was a significant difference seen in the diabetic group, vitamin D was lower in the diabetic group compared to the non-diabetic group<sup>(31, 32)</sup>. The difference in the results may be due to that our study has the smaller sample size and the age of our diabetic and non-diabetic group was between (37-64) years, which means participant's age was middle age and elderly patients in this study. In two other studies, one of them was done in Iraq to know the variation of vitamin D in respect of age; sex and nationality both

prove that vitamin D level affected by age, sex and gender<sup>(33, 34)</sup>.

The vitamin D's level was higher among male patients than female patients with significant differences; P-value of this was (0.024). This could be explained by that females have less sun exposure compared to males, and wear more clothes that cover most parts of the body and go out little.

There is a negative relationship between vitamin D and HbA1c which means those diabetic patients have a low level of vitamin D, have poor control of their glycemic control (P-Value = 0.06). This need to be proved by the correction of vitamin D and excluding other causes of poor glycemic control. In the studies done to prove that, most but not all, showed that correction of vitamin D affects glycemic control<sup>(35)</sup>.

## Conclusions

The results of this study show that the great majority of our participants have suboptimal vitamin D level. In female patients, vitamin D level was lower than in male patients.

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