

A Hospital Based Assessment of The Prevalence and Severity of Vitamin D Deficiency in Type 2 DM As Well as to Record the Effect of Hyperglycemia on Serum Vitamin D Level

Sudhir Chandra Jha¹, Umesh Chandra Jha², Nehal Hyder³

¹Associate professor, Department of General Medicine, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India.

²Associate professor, Department of General Medicine, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India.

³PG Student, Department of General Medicine, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India.

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Corresponding author: Dr. Nehal Hyder

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Abstract

Aim: To see effect of both high prevalent diseases on each other and to observe prevalence and pattern of vitamin D deficiency in diabetics.

Material & Method: This study was conducted in the Department of General Medicine, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India. Total 180 participants were enrolled in the study out of which 90 healthy people were enrolled as case (Group A) and 90 type 2 diabetic patients as controls (Group B).

Results: Prevalence of low vitamin D level in healthy population was present in 17 patients, while prevalence was 52 patients in Diabetic group. Patients having diabetes duration of less than 5 years, 25.01% were have insufficiency of vitamin D level and 7% had deficiency, 8.1% patients have insufficiency and 12,6% patients have deficiency of vitamin D level. It was found that all three important micro vascular complications: - diabetic retinopathy, diabetic nephropathy and peripheral neuropathy did not have any significant correlation with serum Vitamin D level as p value is greater than 0.05 for all three parameters.

Conclusion: Vitamin D deficiency is highly prevalent in diabetic patients as compared to normal healthy population. All patients of type 2 Diabetes patients must have screened for serum vitamin D level and if found deficient than it should be treated promptly with vitamin D supplements for better control of hyperglycemia.

Keywords: Serum vitamin D level, Type 2 diabetes mellitus, Vitamin D deficiency

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Introduction

The incidence & prevalence of Type-2 Diabetes Mellitus (T2DM) is increasing rapidly. There were greater than 285 million patients worldwide with diabetes

in 2010, increasing to approximately 438 million by 2030. [1]

In India alone 41 million individuals are affected, and this is likely to go up to 70

million by the year 2025. Along with Insulin resistance and relative insulin Deficiency, Inflammatory factors, reactive oxygen species and autoimmune reactions have all strongly emerged as the major pathogenic effectors for diabetes. [2]

It is documented that vitamin D has important functions in the endocrine, paracrine, autocrine systems, and has a significant role in sustaining calcium homeostasis and bone health.[3, 4]

Few Research reported association of that Vitamin D deficiency has been associated with a myriad of metabolic abnormalities, including hypertension, diabetes, dyslipidaemia and obesity.[5] As vitamin D has been showed to have effect on pathophysiology of diabetes and diabetics having very high prevalence of vitamin D deficiency. This study was carried out with aim to see effect of both high prevalent diseases on each other.

The objectives were to assess the prevalence and severity of vitamin D deficiency in type 2 DM as well as to record the effect of hyperglycemia on serum vitamin D level.

Material & Method:

This study was conducted in the Department of General Medicine, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India. Total 180 participants were enrolled in the study out of which 90 healthy people were enrolled as case (Group A) and 90 type 2 diabetic patients as controls (Group B). Controls include age and sex matched healthy individuals.

Patients younger than 18 years, patients with chronic kidney disease, patients taking calcium supplements or vitamin D supplements within last 3 months, patients suffering from any known chronic illness were excluded from this study. The patients fulfilling the above mentioned criteria were selected after informed consent.

All participants included in this study were subjected to complete history and clinical examination. Routine laboratory Investigations like CBC, FBS, RBS, PP2BS, HbA1C, blood urea, serum creatinine, lipid profile, urine albumin and Vitamin D3 levels were done by standard methods. The value of serum vitamin D level was further divided in following category: sufficient = 30-100ng/ml, insufficient=20-29ng/ml, deficiency = less than 20ng/ml. Appropriate statistical methods were used to analyses the results.

Results:

Frequency Distribution of Participants according to Severity of Vitamin D level noted. Prevalence of low vitamin D level in healthy population was present in 17 patients, while prevalence was 52 patients in Diabetic group. Among diabetic patients having abnormal Vitamin D level, majority (52) were having insufficiency, only 10 were having overt vitamin D deficiency in Diabetic patients (Figure 1).

In patients with controlled diabetes as per HbA1C criteria, the prevalence of sufficient, Insufficient and Deficient Vitamin D was 20%, 70% and 10% respectively, where in patients with uncontrolled diabetes it was 10.9%, 60% and 29.0% respectively. There was a significant association between the maintenance of euglycemia and severity of Vitamin D level in diabetic patients, as the p value is less than 0.03 (Table 1).

Patients having diabetes duration of less than 5 years, 25.01% were have insufficiency of vitamin D level and 7% had deficiency, 8.1% patients have insufficiency and 12,6% patients have deficiency of vitamin D level. These findings suggest that duration of having diabetes has no effect on vitamin D levels. Diabetic nephropathy was the most common micro vascular complication seen in type 2 diabetic patients. It was found that all three important micro vascular complications: - diabetic retinopathy,

diabetic nephropathy and peripheral neuropathy did not have any significant correlation with serum Vitamin D level as p value is greater than 0.05 for all three parameters (Table 2).

Patients having diabetes duration of less than 5 years, 25.9% were have insufficiency of vitamin D level and 7.6% had deficiency, 8.3% patients have insufficiency and 1.8% patients have deficiency of vitamin D level. These findings suggest that duration of having

diabetes has no effect on vitamin D levels. Diabetic nephropathy was the most common micro vascular complication seen in type 6 diabetic patients. It was found that all three important micro vascular complications. Diabetic retinopathy, diabetic nephropathy and peripheral neuropathy did not have any significant correlation with serum vitamin D level as p value is greater than 0.05 for all three parameters (Table 3).

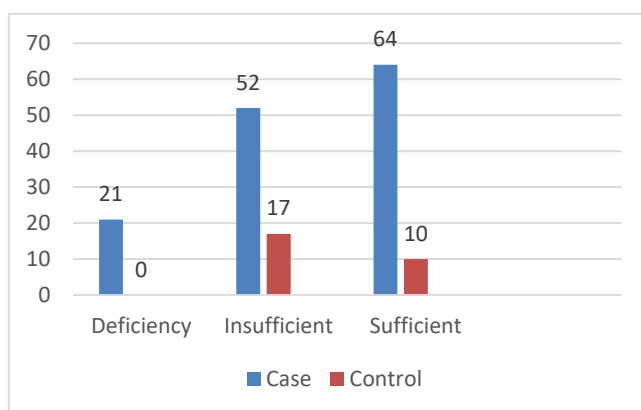


Figure 1: Severity grading of vitamin d deficiency in cases and controls.

Table 1: The association of severity of vitamin D level with the category of diabetes control.

Diabetes Control	Vitamin D Level			p-value
	Sufficient	Insufficient	Deficiency	
Controlled Diabetic N=30	6 (20%)	21 (70%)	3 (10%)	0.03
Uncontrolled Diabetic N=55	6 (10.9%)	33 (60%)	16 (29.0%)	

Table 2: Comparison of mean vitamin D level with duration and micro vascular complication of diabetes mellitus

Parameters		Mean value of vitamin D (ng/dl)	p-value	
Duration of diabetes	1-5 years	25.01±6.22	0.371	
	6-10 years	27.83±7.22		
	>10 years	25.76±4.71		
Micro-vascular complication	Diabetic retinopathy	Present	26.66±6.83	0.047
		Absent	28.28±5.62	
	Diabetic nephropathy	Present	25.82±6.07	0.072
		Absent	26.73±5.82	
	Peripheral neuropathy	Present	24.30±4.74	0.271
		Absent	27.55±5.20	

Table 3: Subgroup analysis- mean vitamin D level in diabetes patients in relation with age, gender and associated co-morbidities

Parameters (Number of patients)		Mean value of vitamin D	p-value
Age group	35-60	25.92±5.73	0.372
	>60	25.41±4.33	
Gender	Male	25.30±3.72	0.723
	Female	25.23±3.24	
HTN	Yes	23.63±5.72	0.077
	No	25.83±8.90	
IHD	Yes	28.63±8.99	0.264
	No	26.48±7.53	

Discussion:

Vitamin D deficiency is a major health problem worldwide. The overall worldwide Vitamin D deficiency prevalence is around 15% according to study done by Pfothnerhauer KM et al. [6]. As vitamin D has been showed to have effect on pathophysiology of diabetes and have very high prevalence of vitamin D deficiency, so we have taken up this study to see effect of both high prevalence diseases on each other. Various studies done in different geographical region and cultural background have shown varied range of prevalence of vitamin D deficiency in diabetic group ranging from 67%-98.8%. [7, 8]

Bani-Issa et al concluded that the less-educated, employed Emirati's participants had a significantly higher percentage of vitamin D deficiency than the higher-educated participants. [9] This is probably because higher education people are more aware and knowledgeable about the benefits and importance of vitamin D by obtaining it either from the food, health supplements, or sunlight exposure. Moreover, the education level is influenced by the differences in the income amount of people. Regarding the differences in the dietary habits between the

T2DM group and the non-diabetic group, this phase of the present trial has observed that there is a highly significant difference

between the diabetic and non-diabetic groups in the consumption of fortified food. This finding might be attributed to the diabetic patients' fear that the fortified food or drinks might contain added sugar that could increase their blood glucose levels.

Bashir et al and Ifigenia-Kostoglou A et al studies had shown higher prevalence of vitamin D deficiency in diabetes mellitus patients compared to healthy individuals, but two other studies had shown no difference of prevalence between diabetic and healthy population. [10-13] So, we have compared the mean value of serum vitamin D level in diabetic patients and in healthy population of various study. Various studies including our study had low mean level of vitamin D for diabetic patients in comparison to healthy population. [10-13]

Modi KD et al found that vitamin D levels in patients with controlled diabetes was 22.4±18.6 while in uncontrolled diabetic patients it was lower, 19.9±18.3 which is statistically significant. Overall insufficiency is more common than deficiency state in diabetic patients regardless of diabetic control status, but severe vitamin D deficiency is more prevalent when patients were having uncontrolled diabetes than controlled diabetes (25% and 13.4% respectively). On Pearson correlation, the study has demonstrated negative correlation between

HbA1C level and serum vitamin D level. It suggesting that as HbA1C level increase, there is decrease in serum vitamin D level. [14]

In patients with controlled diabetes as per HbA1C criteria, the prevalence of sufficient, insufficient and deficient Vitamin D was 7(21.88%), 21(65.63%) and 4(12.5%) respectively, where in patients with uncontrolled diabetes it was 6(13.04%), 30(65.22%) and 10(21.74%) respectively. More number of diabetic patients with uncontrolled status (21.74%) was having overt vitamin D deficiency in comparison to controlled status (12.5%). Vitamin D deficiency and insufficiency (%) was more prevalent among nondiabetic patients than T2DM patients (44.4 vs. 28.6 and 14.4 vs. 11.9, respectively) found by Subramanian A [15]. Study by Shalini P et al found that Vitamin D deficiency is more prevalent (80.4%) in hypertensive patients than healthy (67.7%) individuals. [15-17]

Conclusion:

Vitamin D deficiency is highly prevalent in diabetic patients as compare to normal healthy population. All patients of type 2 Diabetes patients must have screened for serum vitamin D level and if found deficient than it should be treated promptly with vitamin D supplements for better control of hyperglycemia.

All patients with type 2 diabetes mellitus must be screened for vitamin D levels and those found to be having insufficiency or deficiency of vitamin D should be started on vitamin D supplements. Also, strict control of diabetic status is mandatory in order to prevent vitamin D deficiency.

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