

Evaluation of Serum 25-Hydroxyvitamin D Levels in Type 2 Diabetes Mellitus Patients

Dr. Garima Sehgal¹, Dr. Jasvir Singh², Dr. Sanjeev Kumar³

¹Department of Biochemistry, Government Medical College Patiala, Punjab

²Assistant Professor, Department of Biochemistry, Government Medical College Patiala, Punjab

³Professor, Department of Internal Medicine, Rajindra Hospital Patiala, Punjab

Corresponding Author: Dr. Garima Sehgal

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ABSTRACT

Background: Vitamin D plays an important role in calcium metabolism and vitamin D deficiency may be associated with a range of diseases, including cardiovascular disease and type 2 diabetes and has been associated with impaired insulin action, through direct effect of vitamin D on the β -cell function.

Aim: To evaluate serum 25-Hydroxy vitamin D levels in type 2 diabetes mellitus patients.

Materials And Methods: The study was conducted on 45 diagnosed type 2 Diabetes mellitus patients and 25 non-diabetic age and gender matched control in the Department of Biochemistry, Government Medical College Patiala sample was collected in plain vial and serum 25-hydroxy vitamin D levels were evaluated by ELISA technique and the results were statistically analysed.

Results: The Mean values of serum 25-hydroxyvitamin D levels in study group and control group were 16.31 ± 14.03 and 26.63 ± 16.54 respectively (Normal Value of vitamin D = 30-74 ng/ml). The decrease in Vitamin D levels in study group as compared to control group shows statistically significant association (p value < 0.07).

Conclusions: Vitamin D levels appeared to be lower in diabetes mellitus type 2 patients than in the control group. These findings may have therapeutic implications as cautious vitamin D supplementation may improve glycemic control in diabetes mellitus type 2.

Key Words: Type 2 Diabetes Mellitus, 25-Hydroxy Vitamin D, Vitamin D receptors, Beta cells of Pancreas

INTRODUCTION

With the increasing prevalence of DM all over the world, it is expected that this disorder will remain as one of the main causes of morbidity and mortality. [1] In recent years, studies have shown that using vitamin D can help decrease the incidence of diabetes and adjustment of insulin and glucose. [2] Vitamin D has been shown to stimulate insulin production. [3] Association between low vitamin D levels and decreased insulin sensitivity has been reported. [4] Mild to moderate vitamin D insufficiency has

been proposed as a risk factor for type 2 diabetes. Higher plasma vitamin D has been shown to be related with a lower risk for the development of diabetes mellitus in high risk patients. [5]

Low vitamin D concentrations are associated with a higher likelihood of the occurrence of diabetic complications, such as cardiovascular disease, [6] renal impairment [7] and peripheral arterial disease. [8] In addition, diabetic patients are a high risk category for developing vitamin

D deficiency, which may potentially lead to diabetic complications.

Studies done on the administration of vitamin D supplements in vitamin D-sufficient patients with DM type 2 have yielded conflicting results. Some have reported an improvement of glycaemic control; [9] others have reported no effect, [10] while others have shown that the restoration of vitamin D reserves in vitamin D-deficient patients improved glucose tolerance. [10]

This study aimed to evaluate the levels of 25-Hydroxy vitamin D status among patients with Type 2 diabetes Mellitus.

MATERIALS AND METHODS

A Hospital based cross-sectional study was carried out in Department of Biochemistry, Rajindra Hospital Patiala on 70 subject including 45 diagnosed cases of type-2 diabetes mellitus and 25 healthy age and gender matched subjects as control and In 25-Hydroxyvitamin D and glycosylated haemoglobin levels were evaluated.

Inclusion Criteria included Patients of type II diabetes mellitus on diet modification /or oral hypoglycemic agents treatment and Patients aged between 35-80 years.

Exclusion Criteria included Insulin therapy, Consumption of Vitamin D or Calcium, Renal failure, nephrotic syndrome Liver disorder with Ascites, Hypoalbuminemia, Coagulation disorders and treatment with drugs like Carbamazepine, phenobarbital sodium valproate isoniazid which interfere with Vitamin D metabolism.

Blood sample was collected in plain vial and EDTA vial .Serum concentration of 25(OH) D ,FBS,HbA1c were measured by enzyme linked immunosorbent assay (ELISA) method ,GOD POD method and Ion Exchange method respectively. The data was collected and statically analyzed using student t-test. A p-value less than 0.05 was considered significant.

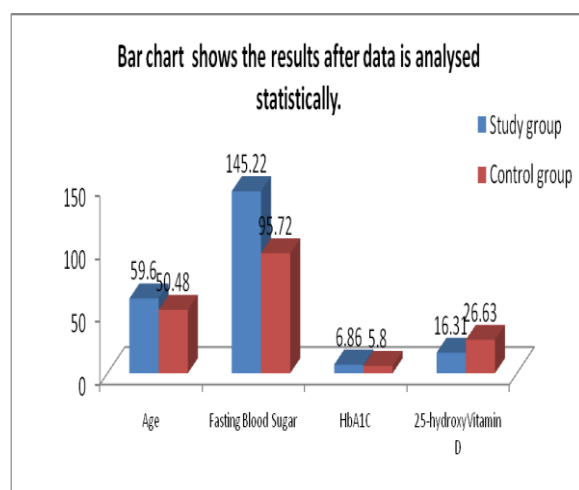
RESULTS

The Mean age in study group was 59.60 ± 9.05 and in control group 50.48 ± 10.77 and the mean FBS in study group was 145.22 ± 44.37 and 95.72 ± 11.68 for control group. The Mean levels of HbA1C in Study group were 6.86 ± 0.85 while for control group 5.80 ± 0.66 . The mean concentration of 25-Hydroxyvitamin D in diabetic patients was 16.31 ± 14.03 ng/dl and in the non-diabetic patients was 26.63 ± 16.54 ng/dl ($p=0.007$).

Table 1 shows the results after data is analysed statistically.

Parameter	Study group	Control group	P Value	Significance
Age	59.60 ± 9.05	50.48 ± 10.77	<0.001	HS
Fasting Blood Sugar	145.22 ± 44.37	95.72 ± 11.68	0.000	HS
HbA1C	6.86 ± 0.85	5.80 ± 0.66	0.000	HS
25-hydroxyVitamin D	16.31 ± 14.03	26.63 ± 16.54	<0.007	S

*HS (Highly Significant), S (Significant)



In the study group of diabetes mellitus type 2 patients, 25(OH)D₃ levels were lower than in the control group, levels being 16.31 ± 14.03 ng/ml and 26.63 ± 16.54 ng/ml in the patient and control group, respectively ($p < 0.007$).

DISCUSSION

In several cross-sectional studies, patients with Type 2 DM or glucose intolerance were found to have lower serum 25-hydroxy vitamin D concentrations as compared to individuals without diabetes. [11]

Our study concluded that there was a statistical difference between 25-hydroxyvitamin D concentration in diabetic patients and the healthy subjects. [Need et al] [12] showed that the patients who had higher levels of vitamin D concentration had lower FBS in comparison with the other groups. These results were similar to our findings. [Lee et al] [13] Observed that 89% of their study individuals suffered from deficiency of this vitamin and just 9 out of 300 persons had sufficient vitamin D concentration. They also found that the mean concentration of 25-hydroxyvitamin D in their patients was 26.11 ± 13.6 this is higher than our findings in the diabetic patients. This difference is may be due to the result of different sunshine duration status in Korea and in Iran.

In a cross-sectional analysis of a general population sample in eastern Finland, [Hurskainen et al. 2012] [14] an inverse association was observed between 25(OH)D3 levels and fasting insulin, fasting glucose and 2 h glucose tolerance test glucose, implying that low serum 25(OH)D3 may be associated with impaired glucose metabolism. [Gagnon et al.] [15] observed that the mean serum concentration of 25-hydroxyvitamin D in diabetic patients was lower than the non-diabetic individuals. [15] Vitamin D receptors have been found in pancreatic beta cells which have been found to express the enzyme 1- α -hydroxylase. Vitamin D facilitates the secretion of insulin from pancreatic beta cells, thus appearing to regulate insulin secretion. Therefore vitamin D deficiency may be related to impaired insulin secretion in diabetes mellitus type 2. [16] A positive role for vitamin D in the modification of the function of β -cells of the pancreas has been reported. This role is mediated through several pathways, including direct stimulation of insulin secretion by vitamin D through the presence of vitamin D receptors (VDRs) in β -cells of the pancreas and their expression of 1- α -hydroxylase enzyme. Also, 1,25-(OH)2D is able to activate transcription of the gene of

human insulin and thus play an essential role in insulin secretion. [16]

Limitations: Firstly we took only one sample in one season for analysis and because of sunshine duration difference in each season level of vitamin D may undulate during the year, so this study cannot predict the condition of hypovitaminosis in this area. In addition, 25(OH)D3 was chosen as a marker of vitamin D deficiency, as currently recommended. However, vitamin D circulates in several forms in the blood and its active form is 1,25(OH)2D3.

CONCLUSION

In conclusion, our findings demonstrated that 25-hydroxyvitamin D concentration in type 2 diabetic patients was significantly lower in comparison to non-diabetic individuals. Hence, treating the patients of type 2 Diabetes mellitus with vitamin D supplements may be useful in retarding the development of clinical symptoms of the disease.

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