



Study of Vitamin D Levels in Type II Diabetic Patients

KEYWORDS

Diabetes Mellitus & Vitamin D level

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ABSTRACT

Aim & objectives : To study vitamin D level in type 2 Diabetes Mellitus. To study the association between vitamin D level with glycemic control, gender & different religions.

Material & methods: Levels of serum Vitamin D were analysed on chemiluminiscent autoanalyser. A total 202 patients of Diabetes were included of which 124 were males & 78 were females.

Results: In this study we found severe vitamin D deficiency in 15% diabetics. Moderate vitamin D deficiency was observed in 27% diabetics. Mild vitamin D deficiency was observed in 29.5% diabetics.

Conclusion: Uncontrolled diabetics had high blood sugar levels. Thus it can be predicted that vitamin D deficiency is common amongst diabetic population & that might have contributed to uncontrolled diabetes.

INTRODUCTION

Vitamin D deficiency is common deficiency disorder in population worldwide. India is tropical country extending from 8.4°N latitude to 37.6°N latitude. Majority of population lives in areas receiving ample sunlight throughout the year. Still data available in the published literature saying vitamin D deficiency is very common. About one billion people worldwide have vitamin D deficiency. (2)

The incidence of type 2 diabetes mellitus is increasing at an alarming rate both nationally and worldwide, with more than 1 million new cases per year diagnosed in the United States alone (1). Diabetes is the fifth leading cause of death in the United States, and it is also a major cause of significant morbidity. Low levels of vitamin D may be a risk factor for the development of both type 2 [1] and type 1 [2] diabetes.

Vitamin D : It is fat soluble vitamin, synthesized in the skin from 7 hydrochlesterol in subcutaneous fat. The levels are influenced by sun exposure, dietary intake of Vitamin D, age, race, geographic region of residence, season, BMI or body fatness, physical activity & pollution.

30 minutes exposure of skin over arms & face to sunlight without sunscreen preferably between 10 am to 2 pm, as maximum UVB rays are transmitted during this time daily is adequate to avoid vitamin D deficiency (1).

The vitamin D₃ synthesised in the skin is biologically inactive. It is activated by enzyme 25-hydroxylase to 25-hydroxycholecalciferol (25(OH)D₃) in the liver. Then by 1-alpha-hydroxylase (kidney & other tissues) hydroxylates to 25(OH)D₃, which is active Vit D.

Vitamin D may also reduce apoptosis of β cells in type 2 diabetes. Vit D and parathyroid hormone regulate calcium homeostasis (3). Also limits inflammatory reactions [6] and increasing calbindin, a cytosolic calcium binding protein [4]. Thus Vitamin D has beneficial effect on insulin action.

It acts both directly by stimulation expression of insulin receptor & so enhancing insulin responsiveness for glucose transport (5).

Seasonal variation in glycemic control reported in patients with type 2 DM being worse in the winter, which can, be due to hypovitaminosis D in the winter (3).

Recently many studies have showed that vitamin D deficiency can be a risk factor in glucose homeostasis. (4)

MEDLINE review January 2007 show a relatively consistent association between low vitamin D status, calcium or dairy intake. Type 2 DM, metabolic syndrome are related to glucose homeostasis (7,10).

Insulin secretion & vitamin D-

When glucose enters a β cell, ATP production is increased and the resulting high levels of ATP/ADP lead to closure of the potassium channels in the membrane. This increases the influx of calcium, which stimulates insulin secretion from the β cell. Vitamin D stimulates this glucose-stimulated insulin secretion [10]. The β cell has a vitamin D receptor that binds 1,25-(OH)₂ D₃. 1-alpha-hydroxylase is also found inside the β cell [11]. It is not clear whether the effect of vitamin D is a consequence of increased availability of intracellular calcium(5).

In islet cells & adipose tissue of type 2 diabetics, signs of

inflammation are observed contributing to insulin resistance [8]. Vitamin D inhibits the release and down-regulates increased levels of inflammatory markers such as interleukin (IL)-6, IL-1, and IL-8, intracellular adhesion molecule-1, and cyclo-oxygenase-2 [6]. Thus vitamin D may have positive effect on islet cells and the reduction of elevated C-protein level. This indicates of (vascular) inflammatory processes in type 2 diabetes.

Insulin Resistance-

Diabetes mellitus is always associated with insulin resistance. (5) In obesity, fat metabolism is more prominent and higher levels of free fatty acids are seen. High amounts of fatty acids in the cell reduce the formation of ATP, which decreases insulin secretion in the β cell [12].

In north Indian study vitamin D requirement of 60,000-1,20,000 IU/month to achieve Vitamin D level > 30 ng/ml. While another study reported to have supplementation of Vitamin D atleast 2,000 IU/day (2)

Recent data suggests vitamin D and calcium as modifiers of diabetes risk (11)

More recently, there is accumulating evidence to suggest that altered vitamin D and calcium homeostasis may also play a role in the development of type 2 DM (14).

Material & Methods

Study Design - Descriptive cross sectional study.

Sampling - All Diabetic patients attending Medicine OPD.

Sample size - Calculated 202 patients.

This is a cross sectional study carried out at Bharati Medical College, Sangli.

1. 202 diabetic patients were selected from those attending,
2. Medicine OPD for Diabetes control.
3. Dr. Milind Patwardhan's Endocrinology Clinic at Miraj.

Exclusion Criteria-

H/O major illness

H/O Fracture

Malignancy

Osteoporosis

Infections

Autoimmune Disorders

Ethical committee clearance was taken.

History & clinical examination of each patient was done thoroughly.

Results-Asia-

Severe vitamin D deficiency - <10 ng/ml.

Moderate vitamin D deficiency - 10-20 ng/ml.

Mild vitamin D deficiency - 20-30 ng/ml.

Normal vitamin D level - >30 ng/ml.

Descriptive Statistics

1) Two-Sample T-Test: Vitamin D, Glycemic control

Variable	N	Mean	Std. Dev.	Minimum	Maximum
Vit D_P	202	22.33	16.01	1.8	125.2
F-BSL_P	202	163.32	58.87	66	332

2) Two-Sample T-Test: Vitamin D, Sex

Sex	N	Mean	Std dev	P- Value
F	124	21.7	19.6	0.218
M	78	23.26	7.26	

T-Test of difference = 0 (vs <): T-Value = -0.78 P-Value = 0.218 DF = 169

3) Two-Sample T-Test and CI : Vitamin D, Religion

Religion	N	Mean	Std Dev	P-Value
Hindu	175	22.6	16.8	0.850
Muslim	27	20.36	9.11	

4) T-Test of difference = 0 (vs <): T-Value = 1.05 P-Value = 0.850 DF = 58

	N	Mean
Vit D_levels	202	22.3

5) Correlation between F-BSL and Vit D in diabetic patients

Pearson correlation of F-BSL_P and Vit D_P = -0.263

DISCUSSION-

As vitamin D deficiency is common all over world, more in diabetics. Deficiency increases insulin resistance. Thus plays important role in Glucose homeostasis.

In the Nurses Health Study, the group of female nurses with the highest intake of calcium (>1200 mg/d) and vitamin D (>800 IU/d) that was associated with the lowest risk of incidence type 2 DM was only 1.3% of the cohort (12).

Data from NHANES III showed that, vitamin D insufficiency (25-OHD < 25 ng/ml) in half of the noninstitutionalized adolescent and adult population in the United States, they have reported vitamin D insufficiency southern latitudes during the winter (9).

In our study, we have noticed vitamin D deficiency in diabetics mean 22.3 ng/ml deviation. There is no difference in Vit D levels was observed in male & female genders.

In muslim religion Vit D levels were low especially in female who use burkha.

1) We had 15% diabetics with severe vit D deficiency, 5% of them were symptomatic.

2) 27% diabetics had moderate vit D deficiency, all were asymptomatic.

3) 29.5% diabetics had mild vit D deficiency.

4) Uncontrolled diabetics showed severe vitamin D deficiency while euglycemic diabetics had relatively normal vit D levels.

5)1% controls had high vit D levels.

6) There was no difference in vit D levels in male & female genders.

7) We did not find any difference in vit D levels in different religions.

Evidence from trials with vitamin D and/or calcium supplementation suggests that combined vitamin D and calcium supplementation may have a role in the prevention of type 2 DM only in populations at high risk (i.e. glucose intolerance).

Studies in several cohorts with varied baseline vitamin D status have reported an association between vitamin D deficiency and impaired glucose-mediated insulin release. Vitamin D supplementation improved insulin release in some (13), but not all small-scale short-term randomized trials.

Inadequate calcium intake or vitamin D insufficiency may alter the balance between the extracellular and intracellular -cell calcium pools, which may interfere with normal insulin release, especially in response to a glucose load.

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