



Original Research Article

Vitamin D levels in type 2 diabetics on insulin sensitizers vis a vis in newly diagnosed diabetics

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ABSTRACT

Objective: Vitamin D mediates a pivotal role and major risk factor in the development of type 2 diabetes mellitus mediated by alteration in the insulin sensitivity or β -cell physiological function, or both. The present study was carried out to analyze the serum levels of vitamin D3 in type 2 diabetics on insulin sensitizers and in newly diagnosed diabetics.

Materials and Methods: In this 100 subjects were enrolled and they are divided in two groups, newly diagnosed type 2 diabetics and type 2 diabetics on insulin sensitizers. Serum vitamin D3 was measured by chemiluminescence microparticle immunoassay. Fasting plasma glucose level was measured by hexokinase method using the Dimension clinical chemistry system.

Results: In this study, the mean serum vitamin D3 level was significantly ($p < 0.05$) low in newly diagnosed type 2 diabetes mellitus subjects as compared to the type 2 diabetics on insulin sensitizers (10.33 ± 2.56 vs 20.89 ± 3.24 ng/ml). Further, in patients who were on treatment with insulin sensitizers showed normal level of Vitamin D3 and Fasting blood glucose. Conclusion: Thus, vitamin D3 deficiency is the hallmark status in diabetes mellitus and maintenance of type 2 DM with insulin sensitizers may ameliorate the vitamin D deficiency.

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1. Introduction

Vitamin D3, a steroid involved in the bone metabolism and synthesized in the skin by ultraviolet radiation from the sun. Further, there exists a strong association between vitamin D3 and immune function and array of reports shows vitamin D is primarily involved in the immune tolerance. Vitamin D3 deficiency is also involved in the progression of autoimmune disease like multiple sclerosis.¹ Globally, there has been a steeping increase in the prevalence of metabolic disorder, especially type 2 diabetes mellitus (T2DM).² The rampant increase in the disease creates a major disability and economic burden. Further, the disease not only prevalent in adults, but has become increasingly evident in children as well.³ Recently, Vitamin D deficiency has been interrelated to wide array of disease like cancer and autoimmune disorders and particularly related to metabolic

disorders like diabetes and obesity.⁴ Albeit, the familial history and genetics is the mainstay in the development of T2DM, environmental changes, high fat diet, lack of nutrition and obesity also orchestrate a pivotal role in the etiology of diabetes.

Recent clinical studies, shows that vitamin D insufficiency, measured in terms of serum 25-hydroxyvitamin D3 level also contribute to the progression of T2DM.⁵ Thus the complex mechanism of type 2 DM reveals the association of various pathways, organs, tissues and hormones.⁶ Thus, it visualizes that T2DM cannot manifest without β -cell failure. So, it is vital to delineate the role of vitamin D metabolites (1, 25(OH)2D3) in physiological function of pancreatic β -cell. The enzyme 1 α (OH)ase is not only highly attributed to be located in renal tissue but also found in extra renal tissues like pancreatic β -cells.⁷ This suggests that 1 α (OH)ase orchestrates a predominant role in overall β -cell function. Further, invitro and preclinical studies shows that 1, 25(OH)2D3 is highly

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cardinal for insulin release and glucose homeostasis.⁸ So these research evidences substantiates that low level of vitamin D alters the pancreatic β -cell function and that vitamin D administration enhances the biological efficacy of pancreatic β -cell.⁹ Currently, the incidence of hypovitaminosis D is increasing alarmly and noted as predominant risk factor to elicit glucose intolerance.¹⁰ In this notion, the current study was undertaken to evaluate the vitamin D level s type 2 diabetic subjects on insulin sensitizers and also in newly diagnosed diabetics.

2. Materials and Methods

The present study was carried out in LLRM Medical College, Department of Biochemistry during the period between December 2016-February 2018. Fifty newly diagnosed type 2 diabetic patients irrespective of sex, aged in the range between 50-70 years attending the OPD were included in the study as Group 1. Further, Type 2 diabetic patients who were on treatment with metformin / pioglitazone of both sexes, age between 50 to 70 years were enrolled and designated as Group 2.

2.1. Inclusion criteria

1. Newly diagnosed type 2 diabetes subjects.
2. Type 2 diabetics who were on treatment with metformin/pioglitazone for a period of 6 months.

2.2. Exclusion criteria

1. Type 1 / Type 2 diabetics on insulin therapy
2. Diabetic patients having Vit D and Ca supplementation
3. Diabetic patients with hepatic and renal disorders
4. Diabetic more than 70 yrs of age
5. Gestational diabetics

The blood sample was collected from each patient with careful monitoring. The fasting plasma glucose were done by hexokinase method using the Fully autoanalyser Selectra-E. Immunoturbidimetric method was used to measure the glycated haemoglobin levels using Bio-RAD D 10. Serum vitamin D3 was estimated by chemiluminescence microparticle immunoassay. Hypovitaminosis D was defined as a serum 25(OH) D level below 20 ng/ mL.

2.3. Statistical analysis

The statistical analysis performed using SPSS. The results are shown as mean \pm SD (Standard Deviation) and median (range). Comparison was done using unpaired t-test, X² test. The p value of <0.05 was denoted as statistically significant.

3. Results

In the present study, out of 50 newly diagnosed diabetic patients (Group 1) 35 were males and 15 were females. Meanwhile, out of 50 diabetic patients who were on treatment with insulin sensitizers (Group 2) 28 were males and 22 were females. The mean age in group 1 patients were 65.87 \pm 12.76 years, whilst in the group 2 patients it was found to be 65.45 \pm 11.24 years respectively.

The Vitamin D level in newly diagnosed diabetics was found to be 10.33 \pm 2.56 ng/ml. Meanwhile in type 2 diabetics on insulin sensitizers the Vitamin D level was found to be 20.89 \pm 3.24 ng/ml (Table 1). In newly diagnosed diabetics there exists a hypovitaminosis D and it was found to be statistically significant (p<0.05) when compared to diabetic patients who were on treatment with insulin sensitizers.

The HbA1C levels was found to significantly (p<0.05) elevated in newly diagnosed diabetics as that of the type 2 diabetics on insulin sensitizers with strict glucose control (8.2 \pm 1.25% vs 5.87 \pm 0.87 %) respectively (Table 2).

Table 1: Vitamin D status in the present study

S.No	Groups	Vitamin D (ng/ml)
1	Newly diagnosed Diabetics	10.33 \pm 2.56
2	Diabetics on treatment	20.89 \pm 3.24 *

The data were expressed as mean \pm SD. The comparison was made between diabetics on treatment and newly diagnosed diabetics using unpaired t-test, X² test. *indicates p<0.05 and statistically significant.

Table 2: Glycated hemoglobin (HbA1C) levels in the present study

S.No	Groups	HbA1C (%)
1	Newly diagnosed Diabetics	8.2 \pm 1.25
2	Diabetics on treatment	5.87 \pm 0.87

The data were expressed as mean \pm SD. The comparison was made between diabetics on treatment and newly diagnosed diabetics using unpaired t-test, X² test. *indicates p<0.05 and statistically significant.

4. Discussion

Vitamin D3 deficiency is an increasingly recognized health concern related to skeletal and non-skeletal outcomes. Recent studies have shown a significant association between vitamin D3 level and diabetes, so it has been underscored that this might be a major risk factor etiology of type 2 diabetes mellitus by altering insulin sensitivity or loss in β -cell function, or both.¹¹ In the current study, the mean serum vitamin D level was significantly lower in newly diagnosed type 2 diabetes patients as compared to the subjects taking insulin sensitizers. Tracy and Mazen (2010)¹² found that Vitamin D3 deficiency has been linked to type 2 diabetes mellitus, with circulating levels of 25(OH)D3 significantly

($p < 0.008$) lower in type 2 diabetics than in healthy controls. This finding is in correlation to other similar studies done by Targher et al. (2006),¹³ Sung et al. (2012)¹¹ and Chiu et al. (2004).¹⁴ Generally insulin release from beta cells is a calcium dependent process. Insulin secretion is a calcium-dependent process. Further, vitamin D involves in regulation of calcium homeostasis by orchestrating the calcium flux through the plasma membrane and maintains optimal Ca^{2+} concentration.¹⁵ Thus, vitamin D deficiency may be related to altered insulin secretion in type 2 diabetic patients. Meanwhile, vitamin D is involved in the upregulation of insulin receptor and low vitamin D level may lead to insulin resistance.

Since India is a tropical country, there exists a high temperature. Albeit, plenty of sunlight Vitamin D3 deficiency is highly epidemic among the Indian population.¹⁶ This is highly attributed due to darker skin pigmentation, sedentary life style, air pollution, less sunlight exposure, low intake of foods rich in vitamin D etc. The third NHANES report highlights an inverse relationship between vitamin D3 and metabolic risk factors.¹⁷ Mounting studies shows that vitamin D is linked to insulin resistance and insulin release, which are key pathways for the metabolic syndrome like adiposity, diabetes, and hyperlipidemia. Studies indicate a low vitamin D status in subjects affected with central obesity. Thus, the altered vitamin D level elicits various clinical manifestations and along with type 2 diabetes it may lead to comorbid conditions like coronary artery diseases and cerebrovascular diseases.

In this study, the Glycated hemoglobin (HbA1C) level was significantly elevated in newly diagnosed diabetic patients as that of the subjects who were on treatment with insulin sensitizers. However the contrasting results were observed in other studies, in Spain, Calvo -Romero and Ramiro-Lozano evaluated the serum levels of 25-hydroxyvitamin D (25(OH)D) in 130 diabetic patients. The results of study showed that the majority of patients (69.9%) had vitamin D levels less than 20ng/ml. Further, the correlation analysis displayed inverse association between serum levels of 25(OH)D and HbA1C ($r = -0.74$, $P = 0.01$).¹⁸ Another cross-sectional study conducted in Italy, by Zoppini et al to elucidate the correlation between A1C and 25(OH)D has shown an inversion association between the two variables ($r = -0.116$, $p = 0.003$). This relation maintains its independence after adjusting for other cofactors.¹⁹ In another Indian study, Sur and Priya performed a case-control comparative study to assess the significant interrelation between hyperglycemia and vitamin D levels in type 2 Diabetic subjects. The result of the study has shown a negative correlation on Vitamin D levels between the cases and controls. However, Vitamin D level in cases is lower as that of the control.²⁰

In conclusion, the vitamin D level was significantly decreased in diabetic patients and further the HbA1C

level was significantly increased in diabetic patients with decreased Vitamin D level.

5. Source of funding

None.

6. Conflict of interest

None.

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