Volume : 5 | Issue : 6 | June 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Research Paper

# Role of Vitamin- D in Management of Type- 2 Diabetes Mellitus Patients and its Future Prospects

Medical Science

**KEYWORDS :** Type-2 DM, Vitamin D, Calcium, Glycemic control, Future Prospects.

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## ABSTRACT

*Introduction: Type-2 Diabetes Mellitus is a globally prevalent disease. Over the past decade, the relationship of vitamin D deficiency to the risk of developing Type -2 DM and the risk for diabetic complications has been of great interest to scientists. The aim of the present study is to determine vitamin D status among Type-2 diabetics Patients and examine the relationship between vitamin D status and level of glycemic control. Material And Method: The study group comprises 55 confirmed case of Type-2 DM patients, whose (Fasting Blood Glucose level > 126 mg/dl) were selected from the OPD & IPD of Teerthanker Mahaveer Medical College & Research Centre, Moradabad. 40 healthy volunteers, who were matched age and sex with the diabetic patients, were served as controls. In both the groups'*

*blood sample were collected and analyzed for Fasting Blood Sugar (FBS), HbA1C, Vitamin D and Serum Calcium. Prior to start of study Informed consent would be taken from each subject. Results: The mean levels of serum vitamin D and serum calcium of Type -2 DM patients were significantly lower as compared to the normal subjects and this difference is statistically significant ($p < 0.001$). Conclusion: On the basis of result obtained from present study we conclude that low serum level of vitamin- D and Calcium play major role in pathogenesis of Diabetes and related complications. So supplementation of vitamin D with*

*calcium might be helpful in management of Diabetes and associated complications in near future.*

## INTRODUCTION

Diabetes mellitus (DM) is a universal endemic human disease with rapid rising prevalence in both developing and developed countries.[1] **Type-2 DM** is a metabolic disorder that is characterized by hyperglycemia and either insufficient or impaired insulin secretion. The pathogenesis of **Type-2 DM** remains unknown as there are many malfunctioning mechanisms that occur simultaneously which can contribute to the development of the disease.[2] Vitamin D plays a major role in many biological actions.[3] Over the past decade, the relationship of vitamin D deficiency to the risk of developing **Type -2 DM** and the risk for diabetic complications has been of great interest to scientists. The present studies mainly focus on the problems in Type-2 DM patients in association with serum level of Vitamin-D and calcium.

## MATERIAL

The study group comprises 55 confirmed case of **Type-2 DM** patients, who were selected from the OPD & IPD of Teerthanker Mahaveer Medical College & Research Centre, Moradabad. The mean age of subjects was 49.50 ±12.33 years.

### Selection of Cases

Fasting Blood Glucose >125mg/dl and Post Parendial Blood Glucose/Random Blood Glucose >200 mg/dl with typical features were selected as a **Type-2 DM** Patients whereas Fasting Blood Glucose <100mg/dl and Post Parendial Blood Glucose/Random Blood Glucose <140mg/dl without any features or history of diabetes were selected for control/ Non Diabetic case.

### Exclusion Criteria

Type -1 DM, Pregnant women, Children, Patients having any concomitant disease that can alter urinary calcium and serum vitamin-D were excluded from the present study.

## METHODS

In both the groups **(Type-2 DM and Control)** blood sample were collected and analyzed for **FBS, HbA1C, Calcium and Vitamin- D**. Estimation of serum vitamin- D3 concentration will be measured in each specimen by Direct ELISA kit method (immunodiagnostic).[4] Estimation of serum glucose concentration will be measured by (GOD-POD) method.[5] Estimation of HbA1c by boronate affinity chromatography using Nyco card reader.[6] Estimation of serum calcium concentration will be measured by ISE (ion selective electrode) method. The association of Vitamin-D with FBS and HbA1C was evaluated by using the Pearson◎s correlation coefficient. This study was approved by the institutional ethical committee of Teerthanker Mahaveer Medical College & Research Centre, Moradabad, UP. The data of all biochemical parameters were analyzed by using SPSS-16 Version. Student t-test (Unpaired) and Pearson◎s correlation coefficient were used to find the Statistical Significance.

## RESULTS

**Table 1: Comparison of Various biochemical Parameter level between Type-2 DM Patients and Control subjects.**

| Parameters | Type-2 DM (n = 55) | Control (n = 40) | t-value | p-value |
|---|---|---|---|---|
| HbA1C (%) | 7.99 ± 3.4 | 5.23 ± 1.2 | 8.65 | <0.001 |
| FBS (mg/dl) | 193.47 ± 35.52 | 92.6 ± 6.77 | 11.23 | <0.001 |
| Vitamin D(ng/dl) | 16.10 ± 4.60 | 43.65±18.67 | 7.85 | < 0.001 |
| Calcium (mg/dl) | 7.56 ± 1.77 | 9.26 ± 092 | 4.65 | < 0.001 |

**All values expressed as mean ± standard deviation; *P* <0.001 considered statistically significant.**

In **biochemical parameter** the increase in the level of HbA1C & Fasting Blood Sugar (FBS) in Type-2 DM Patients were found to be highly significant ($p < 0.001$). Serum level of Vitamin D & Calcium in Type-2 DM patients were decreased and these parameters were statistically highly significant ($p < 0.001$), when these values were compared with control group (Table-1).

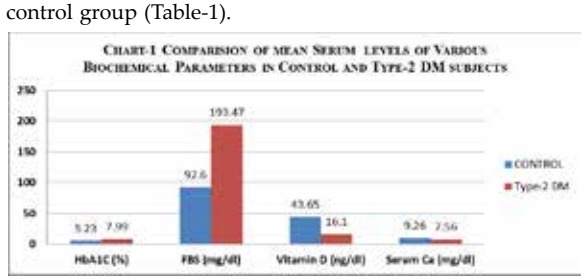


**CHART-1 Histogram of Comparison of various Biochemical Parameters.**

Volume : 5 | Issue : 6 | June 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

## DISCUSSION

**Diabetes Mellitus is a metabolic disease which is caused by absolute or relative insulin deficiency.** The serum level of Vitamin-D was found to be significantly lower in the **Type-2 DM** Patients (16.10 ± 4.60 ng/dl) as compared to control subjects (43.65±18.67ng/dl) and this mean difference is statistically significant ($p < 0.001$).Since vitamin D play a central role in Calcium homeostasis This might be reason for low level of serum calcium found in Type -2 DM patients **Table 1 & Chart 1**. The present study demonstrated that Serum Vitamin-D concentration is inversely associated with hyperglycemia. Low level of serum Vitamin D concentration leads to hyperglycemia in Type -2 DM patients due to impairment of insulin synthesis and secretion and also an increase in the insulin resistance. Earlier finding suggest that vitamin D deficiency may be a risk factor for the metabolic syndrome[7,8], ESRD[9] and Cardiac vascular Disorder patients.[10] The main function of vitamin D is facilitating intestinal calcium absorption. Therefore, insufficient calcium absorption may be the culprit mechanism for the observed associations in our study, either due to vitamin D insufficiency. This study is further supported by data indicating that calcium is essential in normalizing glucose intolerance due to vitamin D deficiency in vivo.[11]

To evaluate the relationship of vitamin D and calcium with the glycemic status of the diabetic patients, Karl Pearson®s correlation coefficient (r) was calculated. In present study it showed, a negative and insignificant correlation between serum vitamin D and serum calcium levels with glycemic status (HbA1c) of an individual with **r = -0.07** and **r = -0.13** values respectively.

However, the available data are limited because the sample size included for this study was too small. Although the evidences available suggest that vitamin D and calcium deficiency is related to hyperglycemia and altered insulin response. Our understanding of the exact mechanisms by which vitamin D and calcium may promote β cell function or ameliorate insulin resistance is incomplete. It is also not clear whether the effects are additive or synergistic. So, a large extended prospective study is suggested. Further studies at the molecular level can be contemplated required to elucidate the role of serum vitamin D and serum calcium levels in modifying the effects of insulin and β cell function in diabetes mellitus.

Circulating levels of serum vitamin D and serum calcium are associated with insulin resistance and are significantly lowered in groups at risk of **Type- 2 DM**. Vitamin D is not

only a regulator of bone and mineral metabolism, but also a potent immunomodulator linked to many major human diseases including glucose homeostasis and insulin resistance. The present study demonstrated that low serum vitamin D and serum calcium level have been related to the development of insulin resistance in **Type- 2 DM**. More importantly, modulation of micronutrients alteration in the setting of diabetes mellitus is nowadays a matter of great interest.

## CONCLUSION

It is possible that in the coming years the hope of new therapeutic strategies based on vitamin D levels with beneficial actions on diabetic complications can be translated into renal clinical treatments. These observations have added considerable weight to this study which, when further elaborated, may yield better measures to predict, prevent and treat **Type- 2 DM** Patients.

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