

# A study of vitamin D deficiency in newly diagnosed type ii diabetes mellitus patients at a tertiary health care centre

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## Abstract

**Background:** Diabetes mellitus is a metabolic disorder characterized by impairment in the metabolism of carbohydrates, lipids and proteins. Vitamin D plays an important role in glucose metabolism affecting insulin secretion and insulin resistance. Present study was conducted to see the prevalence of vitamin D in diabetic patients. **Aim and objective:** To study the prevalence of Vitamin D deficiency in newly diagnosed type II diabetes Mellitus patients at a tertiary health care centre **Methodology:** Present study was a comparative study carried out on newly diagnosed patients of type II diabetes Mellitus and their healthy controls. Data was collected with pre tested questionnaire. Data included demographic data, clinical history and clinical examination. Anthropometric measurements, blood sugar level, and serum vitamin level was measured and recorded. Data was analysed with appropriate statistical tests. **Results:** Mean age of the cases was 51.6±2.3 years and mean age of the control group was 52.1±3.1 years. BMI of cases group was 31.3±3.1 kg/m<sup>2</sup> and of control group was 28.2±2.1 Kg/m<sup>2</sup>. BMI of the cases was significantly higher than control group (p=0.001). Mean Vitamin D level in cases was 13.3± 7.4 ng/mL . In control group mean vitamin D level was 22.3 ± 9.2 ng/mL. Vitamin D was found to be significantly higher control group as compared to cases (t value 5.39, p value = 0.0001). Vitamin D deficiency prevalence in type II diabetic patients was 62%.

**Key Word:** vitamin D deficiency.

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## INTRODUCTION

Vitamin D is a fat soluble vitamin. Normal body function is regulated by vitamin D. Vitamin D is produced endogenously when exposed to ultraviolet rays. It is naturally present in few foods. For activation vitamin undergoes hydroxylation in body. There are two major forms of vitamin D, vitamin D<sub>2</sub> (ergocalciferol) and vitamin D<sub>3</sub> (cholecalciferol).<sup>1</sup> Vitamin D acts on vitamin D receptors that are found in many different tissues in the

body, and plays an important role in glucose regulation, cardiovascular system, bone mineral density and many other biological functions.<sup>2,3</sup> Vitamin D deficiency is major nutritional health problem in adults across the world. In India various studies have shown that vitamin D deficiency is commonly observed in all age groups.<sup>4,5</sup> Vitamin D has an important role in glucose metabolism. It regulates insulin secretion and it increases the insulin sensitivity of the tissue.<sup>6</sup> Diabetes Mellitus is an endocrine disease characterised by impaired pancreatic cell function and insulin resistance. Vitamin D affects these activities in diabetic patients. Vitamin D is likely to indirectly affect insulin secretion and insulin sensitivity through beta cells and environmental tissues that are the targets of insulin.<sup>7</sup> Various Previous studies studied the relationship between vitamin D deficiency and changes in blood glucose and insulin. They also studied sensitivity of tissues targeted for insulin. Deficiency of vitamin D in patients of type 2 diabetes is likely to cause a metabolic syndrome.<sup>8,9</sup> Many researchers have observed that 25-hydroxyvitamin D serum level is significantly lower in diabetic patients than

healthy individuals.<sup>10-12</sup> Replacement of vitamin D reduces the resistance to insulin and improves the glucose metabolism in diabetic patients.<sup>13</sup> Present study was conducted to see the vitamin D level in patients of newly diagnosed type II diabetic patients.

**Aim and objectives:** To study the prevalence of Vitamin D deficiency in newly diagnosed type II diabetes Mellitus patients at a tertiary health care centre

## MATERIAL AND METHODS

Present study was a comparative study carried out at a tertiary health care centre. Study population was newly diagnosed patients of type II diabetes Mellitus and their healthy controls. Total 50 cases were enrolled and their healthy controls were 50. Controls were subjects without diabetes mellitus and matched for age and gender.

### Inclusion criteria:

1. Patients diagnosed with type II diabetes mellitus within 1 year and on antidiabetic treatment with medicines
2. Patients not taking Vitamin D or other drugs like corticosteroids, anticonvulsants, and contraceptives)
3. Non alcoholic and non smokers

### Exclusion criteria:

1. Patients with diabetes for more than 1 year.
2. Type I diabetes mellitus
3. Patients suffering from severe complications of diabetes (nephropathy, retinopathy etc), and HbA1C >11%.
4. Females who have attended menopause
5. Pregnant females
6. Patients with history of angina, myocardial infarction
7. Patients with chronic diseases of kidney, liver or thyroid
8. Patients taking any treatment in form of calcium supplements

Study was approved by ethical committee of the institute. A valid written consent was taken from the patients after explaining study to them. Data was collected with pre tested questionnaire. Data included demographic data, clinical history (duration of disease, symptoms). A thorough clinical examination was done. Examination of the patients included recording of height, weight, body mass index (BMI), waist and hip circumference, and measurement of waist-to-hip ratio. BMI was calculated by the formula: body weight in kg/ height in m<sup>2</sup> Blood sugar was measured by fasting and post prandial blood sugar. HbA1C was done. After overnight fasting 10 ml of blood was taken from the patients for measuring fasting blood sugar, lipid profile and serum vitamin D level. HbA1c was measured with high performance liquid chromatography (HPLC)

standardized for the DCCT assay (reference range, 4-6%). The serum level of vitamin D was measured by using the enzyme-linked immunosorbent assay (ELISA) method and applying the kit. Serum vitamin D level was considered as normal if it was 30-100 ng/mL. If vitamin D level was 20-30 ng/mL it was considered as inadequacy of vitamin D. levels < 20 ng/mL were considered as deficiency of vitamin D.<sup>2</sup> Data was entered in the excel sheet. Data was compared among both the groups (cases and controls). Data was analysed with SPSS version 20.

## RESULTS

In our study, we studied total 100 participants. 50 were cases who were diagnosed with type II diabetes Mellitus and 50 controls who were age and sex matched to the cases. Mean age of the cases was 51.6±2.3 years and mean age of the control group was 52.1±3.1 years. The age difference in both the group was statistically not significant (p= 0.36). Thus both the groups were comparable. The mean weight of cases group was 76.4±6.2 kg and control group was 71.3±5.8 kg. Cases were having significantly higher weight as compared to controls (p=0.001). Mean height of the cases and controls were 164.3±8.3 cm and 163.7±7.5 cm respectively. The difference in the mean height of both the groups was statistically not significant (p=0.7) Body Mass Index is used to assess the obesity of the person. BMI of cases group was 31.3±3.1 kg/m<sup>2</sup> and of control group was 28.2±2.1 Kg/m<sup>2</sup>. BMI of the cases was significantly higher than control group (p=0.001). Table 2 showed comparison of different investigations in both the groups. Mean fasting blood sugar in cases group was 161.4±39.3 mg/dl and in control group it was 101.3±21.2 mg/dl. As the cases were diabetic, blood sugar level was higher in that group. Mean HbA1C in cases was 8.2±1.9 and control was 6.2±0.7. The difference was statistically significant (p=0.0001). We measured systolic and diastolic blood pressure of both the groups. Mean systolic blood pressure in cases and controls were 133.7±15.4mm of Hg and 129.6±11.3 mm of Hg respectively. Mean diastolic blood pressure in cases was 78.4±8.04 mm of Hg and 77.3±5.6 mm of Hg respectively. Fig 1 shows Mean Vitamin D level in cases was 13.3± 7.4 ng/mL . In control group mean vitamin D level was 22.3 ± 9.2 ng/mL. Vitamin D was found to be significantly higher control group as compared to cases (t value 5.39, p value = 0.0001). Fig 2 shows distribution of cases and controls according to vitamin D status of the participants. Among the cases, 31(62%) cases were deficient in vitamin D level, 13(26%) were having insufficient vitamin D status. Only 6(12%) patients were having sufficient vitamin D level. Thus vitamin D deficiency prevalence in type II diabetic patients was 62%. Among the control group, 18 (36%) participants were having deficient vitamin D level, 20 (40%) were having

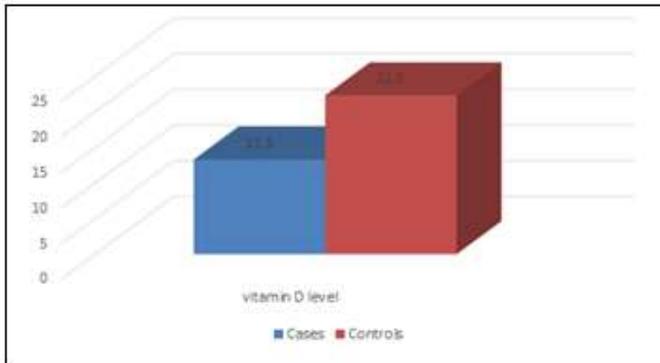
insufficient vitamin D level. 12 (24%) participants were with sufficient vitamin D level.

**Table 1: Comparison Of age and Anthropometric Parameters in Cases and Controls**

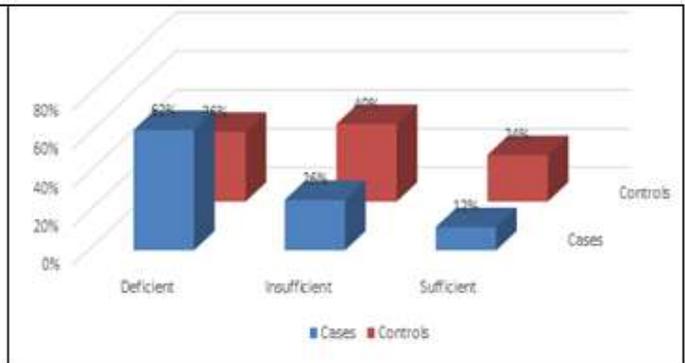
Parameters	Cases	Controls	t value	P value
Age (years)	51.6±2.3	52.1±3.1	0.91	0.36
Weight (kg)	76.4±6.2	71.3±5.8	4.24	0.0001
Height (cm)	164.3±8.3	163.7±7.5	0.37	0.70
BMI (Kg/m <sup>2</sup> )	31.3±3.1	28.2±2.1	5.85	0.0001

**Table 2: Comparison Of investigative Parameters in Cases and Controls**

Parameters	Cases	Controls	t value	P value
Fasting BSL	161.4±39.3	101.3±21.2	9.51	0.0001
HbA1C	8.2±1.9	6.2±0.7	6.98	0.0001
Systolic BP	133.7±15.4	129.6±11.3	1.51	0.13
Diastolic BP	78.4±8.04	77.3±5.6	0.79	0.42



**Figure 1: Mean vitamin D level in cases and controls**



**Figure 2: Distribution of cases and controls according to vitamin D status**

## DISCUSSION

Mean age of the cases was 51.6±2.3 years and mean age of the control group was 52.1±3.1 years. The mean weight of cases group was 76.4±6.2 kg and control group was 71.3±5.8 kg. Cases were having significantly higher weight as compared to controls (p=0.001). In our study, BMI of cases group was 31.3±3.1 kg/m<sup>2</sup> and of control group was 28.2±2.1 Kg/m<sup>2</sup>. BMI of the cases was significantly higher than control group (p=0.001). In a study by Hidayat R *et al.*, they found that the serum level of vitamin D reduces as the BMI increases, and there is a significant statistical relationship between serum level of vitamin D and BMI.<sup>14</sup> In our study, Mean Vitamin D level in cases was 13.3± 7.4 ng/mL . In control group mean vitamin D level was 22.3 ± 9.2 ng/mL. Vitamin D was found to be significantly higher control group as compared to cases (t value 5.39, p value = 0.0001). We found that, among the cases, 31(62%) cases were deficient in vitamin D level, 13(26%) were having insufficient vitamin D status. Only 6(12%) patients were having sufficient vitamin D level. Thus vitamin D deficiency prevalence in type II diabetic patients was 62%. Among the control

group, 18 (36%) participants were having deficient vitamin D level, 20 (40%) were having insufficient vitamin D level. 12 (24%) participants were with sufficient vitamin D level. Lee *et al.* found that 89% of their study individuals suffered from deficiency of vitamin D. They also found that the mean concentration of vit D in their patients was 26.11±13.6 this is higher than our findings in the diabetic patients.<sup>15</sup> In a study by Daga *et al.*, 91.1% of diabetic patients had vit D insufficiency. In their study vit-D concentration in diabetic patients was 7.88±1.2, however, in non-diabetic individuals, it was 16.64±7.83.<sup>16</sup> Similar to our study, Gagnon *et al.* found that the mean serum concentration of vit D in diabetic patients was lower than the non-diabetic individuals.<sup>17</sup> Taheri *et al.* also showed that mean serum concentration of vit D in diabetic patients was 20.6±11.4 and in non-diabetic individuals was 22.22±16.03.<sup>18</sup>

## CONCLUSION

Vit D concentration in diabetic patients was significantly lower in comparison to non-diabetic individuals.

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