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Original Research Article.

Analysis of Serum Vitamin D Levels in Persons with Type 2 Diabetes Mellitus at a Tertiary Care Centre

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ABSTRACT

Background: Vitamin D deficiency is an important risk factor for glucose intolerance. The present study was conducted to assess serum vitamin D levels in persons with type 2 diabetes mellitus.

Materials and Methods: This study was conducted among eligible type 2 diabetes mellitus participants and healthy control participants who volunteered to participate in the study. The total calculated sample size was 180 (90 T2DM and 90 control participants). Assay of serum vitamin D, Plasma glucose assay, Glycated haemoglobin assay were done. Statistical analysis was done using the Statistical Package for Social Sciences, SPSS version 17. P-values less than 0.05 were considered statistically significant.

Results: In the present study total calculated sample size was 180 (90 T2DM and 90 control participants). Vit. D deficiency found in 75.55% T2DM patients and 46.66% healthy controls. Vit. D Insufficiency found in 8.88% T2DM patients and 22.22% healthy controls. Optimal Vit. D found in 15.55% T2DM patients and 31.11% healthy controls. The mean HbA1c and Fasting plasma glucose were higher in the vitamin D deficient group compared to the sufficient group. The mean serum vitamin D level in T2DM subjects with vitamin D deficiency was 9.4±1.3ng/dl and 22.2±7.6 ng/dl in the sufficient group. The mean serum Calcium level in T2DM subjects with vitamin D deficiency was2.22±0.2 mmol/L and 2.25±0.2mmol/L in the sufficient group.

Conclusion: The present study concluded that Vitamin D deficiency is common among the participants in this study. And it shows that there is widespread vitamin D deficiency and insufficiency in both apparently healthy populations and patients with diabetes mellitus.

Keywords: Serum Vitamin D Levels, Type 2 Diabetes Mellitus, Healthy Controls.

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INTRODUCTION

Diabetes is one of the fastest growing health challenges of the 21st century, as the number of adults living with diabetes has more than tripled over the past 20 years. It is estimated that 9.3% of adults aged 20–79 years worldwide (approximately 463 million) and 12% of US adults aged older than 18 years (approximately 30 million) are living with diabetes.[1] The effect of vitamin D on B-cell function and insulin sensitivity has been observed in both animal and human studies.[2] Vitamin D is required for and improves the production of insulin; and also improves insulin sensitivity.[3] Vitamin D facilitates the biosynthetic capacity of B-cell and also accelerates the conversion of pro insulin to insulin.[4] Vitamin D deficiency is an important risk factor for glucose intolerance.[5] Studies have shown impaired insulin synthesis and secretion in animal models with vitamin D deficiency; diabetes onset can be delayed with 1–25-OH vitamin D intake, and some specific studies have reported that vitamin D deficiency contributes to the etiology and progression of type 2 diabetes.[6,7] 25- OH vitamin D concentrations were found to be lower in patients with type 2 diabetes with impaired glucose tolerance than in controls.[8] The present study was conducted to assess serum vitamin D levels in persons with type 2 diabetes mellitus.

MATERIALS AND METHODS

This study was conducted among eligible type 2 diabetes mellitus participants and Healthy control participants who volunteered to participate in the study. Participants were instructed to report between 08:00 a.m and 10:00 a.m (after an overnight fast of 8 to 12 hours) on the appointment date. All participants were clinically

assessed and blood samples for relevant investigations taken. The study participants were recruited into the study after signing the informed consent form indicating free willingness to participate in the study. Approval for the study was obtained from the Ethical Committee of the institute. Patients with Type 2 diabetes mellitus, Participants aged 35 to 65 years with type 2 diabetes mellitus and on oral antidiabetics, apparently healthy participants aged 35 to 65 years.

Patients who were excluded from the study were Participants below 35 years or above 65 years, Participants with type 1 DM, Type 2 DM participants on insulin, Pregnant women, Participants with chronic diseases including renal insufficiency (GFR < 30 ml/min), history of chronic liver disease or ALT > 5 times upper reference limit, tuberculosis, diarrheal or malabsorption state., Patients on vitamin D supplements or drugs that affect vitamin D metabolism such as corticosteroids. The total calculated sample size was 180 (90 T2DM and 90 control participants). In a fasting state, between 08.00 a.m. and 10.00 a.m., 10 ml of venous blood was collected. Assay of serum vitamin D, Plasma glucose assay, Glycated haemoglobin assay were done. Statistical analysis was done using the Statistical Package for Social Sciences, SPSS version 17. Comparisons of the clinical, anthropometric and biochemical variables were analysed using student's T-test. Comparisons of categorical variables were analysed using Chi-square test. P-values less than 0.05 were considered statistically significant.

RESULTS

In the present study total calculated sample size was 180 (90 T2DM and 90 control participants). Vit. D deficiency found in 75.55% T2DM patients and 46.66% healthy controls. Vit. D Insufficiency found in 8.88% T2DM patients and 22.22% healthy controls. Optimal Vit. D found in 15.55% T2DM patients and 31.11% healthy controls. The mean HbA1c and Fasting plasma glucose were higher in the vitamin D deficient group compared to the sufficient group. The mean serum vitamin D level in T2DM subjects with vitamin D deficiency was 9.4±1.3ng/dl and 22.2±7.6ng/dl in the sufficient group. The mean serum Calcium level in T2DM subjects with vitamin D deficiency was2.22±0.2 mmol/L and 2.25±0.2mmol/L in the sufficient group.

Table 1: Distribution of Study Participants by Serum Vitamin D Status.

Vitamin D status	Participants n (%)		P value
	T2DM	Controls	
Vit. D deficiency	68(75.55%)	42(46.66%)	≤0.05
Vit. D Insufficiency	8(8.88%)	20(22.22%)	
Optimal Vit. D	14(15.55%)	28(31.11%)	
Total	90(100%)	90(100%)	

Table 2: Biochemical variables in vitamin D deficient and vitamin D sufficient T2DM subjects.

Variables	Vitamin D Sufficient T2DM (n = 14)	Vitamin D Deficient T2DM (n = 68)	P - value
FPG (mg/dl)	132±42.9	149±54.6	≤0.05
Serum calcium (mmol/L)	2.25±0.2	2.22±0.2	
Vit D3 (ng/dl)	22.2±7.6	9.4±1.3	
HbA1c (%)	6.5 ± 1.3	7.3± 1.7	

DISCUSSION

Over the last decade, low blood 25-hydroxyvitamin D (25[OH]D) level has emerged as a risk factor for type 2 diabetes, and vitamin D supplementation has been hypothesized as a potential intervention to lower diabetes risk.[9,10] Observational studies strongly support an inverse association between blood 25(OH)D level and risk of developing type 2 diabetes in diverse cohorts of variable diabetes risk, especially in persons with prediabetes.[11,12]

In the present study total calculated sample size was 180 (90 T2DM and 90 control participants). Vit. D deficiency found in 75.55% T2DM patients and 46.66% healthy controls. Vit. D Insufficiency found in 8.88% T2DM patients and 22.22% healthy controls. Optimal Vit. D found in 15.55% T2DM patients and 31.11% healthy controls. The mean HbA1c and Fasting plasma glucose were higher in the vitamin D deficient group compared to the sufficient group. The mean serum vitamin D level in T2DM subjects with vitamin D deficiency was 9.4±1.3ng/dl and 22.2±7.6ng/dl in the sufficient group. The mean serum Calcium level in T2DM subjects with vitamin D deficiency was2.22±0.2 mmol/L and 2.25±0.2mmol/L in the sufficient group.

The reported prevalence of vitamin D deficiency among persons with Type 2 diabetes mellitus ranges from 63.5%to 91.1%.[13,14]

The higher levels of HbA1c and Fasting plasma glucose in vitamin D deficient T2DM participants compared with their vitamin D sufficient counterpart is consistent with the inverse relationship between vitamin D levels and glycaemic control reported in other similar studies.[15-17]

Calvo-Romero JM et al studied serum levels of 25-hydroxyvitamin D (25(OH)D) and associated characteristics in type 2 diabetic outpatients with pharmacologic treatment. Seventy-two patients (69.9%) had serum levels of 25(OH)D lower than 20 ng/mL. There was inverse correlation between serum levels of 25(OH)D and glycosylated hemoglobin (r = -0.74, P = 0.01). In 78 patients without insulin therapy, we found inverse correlation between

serum levels of 25(OH)D and fasting serum insulin (r = -0.82, P = 0.001) and Homeostasis Model Assessment-Insulin Resistance (r = -0.51, P < 0.001).[18]

CONCLUSION

The present study concluded that Vitamin D deficiency is common among the participants in this study. And it shows that there is widespread vitamin D deficiency and insufficiency in both apparently healthy populations and patients with diabetes mellitus.

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