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Original Research

Assessment of Serum Vitamin D Level in Non-obese Patients with Type 2 Diabetes

Akriti Garg

Assistant Professor, Department of Pathology, N C Medical College & Hospital, Panipat, Haryana, India

ABSTRACT:

Background: The study was conducted to evaluate the association between Serum Vitamin D Levels in Non-obese Patients with Type 2 Diabetes. **Materials & methods:** A total of 100 patients with presence of type 2 diabetes were enrolled. Complete demographic details of all the patients were obtained. A Performa was made and detailed clinical profile of all the patients was recorded. Another set of 100 subjects were enrolled as control group. All the patients were recalled in the morning and blood samples were obtained. Serum vitamin D levels were evaluated using auto-analyser. All the results were recorded in Microsoft excel sheet. **Results:** Mean age of the diabetic patients and healthy controls was 45.2 years and 41.9 years respectively. Majority proportion of patients of both the study groups were males. Mean serum vitamin D levels among diabetic patients and healthy controls was 15.3 ng/mL and 28.1 ng/mL respectively. While comparing the results statistically, significant results were obtained. **Conclusion:** Serum vitamin D levels were significantly altered in type 2 diabetic patients.

Keywords: Diabetes, Vitamin D

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Corresponding author: Akriti Garg, Assistant Professor, Department of Pathology, N C Medical College & Hospital, Panipat, Haryana, India

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INTRODUCTION

Vitamin D is well known for its major impact on the regulation of calcium and phosphorus balance in the human body and thus in the regulation of bone homeostasis. About thirty years ago further non-classical actions of vitamin D were recognized including its impact on the innate and adaptive immunity. [1] The key function of vitamin D is to regulate calcium and phosphorus homeostasis and in turn vitamin D metabolism is regulated by factors that respond to plasma concentration of calcium, phosphate, and magnesium. Calcitriol (active form of vitamin D) is involved in insulin secretion, inhibition of interleukin production by T-lymphocytes and immunoglobulin by B-lymphocytes, differentiation of monocyte precursor cells, and modulation of cell proliferation. Cells of the immune system such as T-lymphocytes, activated B-lymphocytes, and dendritic cells express vitamin D receptors (VDRs). [2] Dendritic cells also express 1,α-hydroxylase, which suggests that 25-hydroxycholecalciferol (Calcidiol) can be converted to its active form (Calcitriol) locally and so it participates in immune response. Moreover vitamin D is found to play a role in innate immunity against various microbial agents. It upregulates the synthesis of cathelicidin and immunoglobulins. [3] Probably this can be the possible reason behind the curing effects of sunlight on tuberculosis and other infections. [4] Thus, vitamin D is one of the important regulators of immunity. Its deficiency along with triggering stimuli may increase the risk of asthma, allergies, and exacerbation of diseases. [5]

Vitamin D is a hormone related to skeletal integrity. [6] Recently, the extraskeletal effects of vitamin D have raised considerable interest. [7] Vitamin D deficiency appears to be related to the development of diabetes mellitus type 2. [8] Mild to moderate vitamin D insufficiency has been proposed as a risk factor for type 2 diabetes. [8] Higher plasma vitamin D has been shown to be related with a lower risk for the development of diabetes mellitus in high risk patients. [9] Although low levels of VitD have been associated with increases in all-cause and cardiovascular mortality as well as the risk of CVD in the general population, [10] there still remains ample scope for further study of the relationship between VitD status and various clinical variables in patients with Type 2 diabetes mellitus (T2DM). Most studies regarding

VitD and diabetes have focused on the incidence of diabetes. Few studies have evaluated the relationships between VitD status and various pathophysiologic and metabolic parameters in patients with diabetes. [11] A report showed that the increased risk of mortality in patients with T2DM and lower serum 25(OH)D levels persisted even after adjustment for the urine albumin to creatinine ratio (UACR), estimated glomerular filtration rate (eGFR), hemoglobin A1C (HbA1C), diabetes duration, and conventional cardiovascular risk factors. [12] Hence, this study was conducted to evaluate Serum Vitamin D Levels in Non-obese Patients with Type 2 Diabetes.

MATERIALS & METHODS

The present study was conducted to evaluate Serum Vitamin D Levels in Non-obese Patients with Type 2 Diabetes. A total of 100 patients with presence of type 2 diabetes were enrolled. Complete demographic details of all the patients were obtained. A Performa was made and detailed clinical profile of all the patients was recorded. Another set of 100 subjects were enrolled as control group. All the patients were recalled in the morning and blood samples were obtained. Serum vitamin D levels were evaluated using auto-analyser. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

Mean age of the diabetic patients and healthy controls was 45.2 years and 41.9 years respectively. Majority proportion of patients of both the study groups were males. Mean serum vitamin D levels among diabetic patients and healthy controls was 15.3 ng/mL and 28.1 ng/mL respectively. While comparing the results statistically, significant results were obtained.

DISCUSSION

Vitamin D (VitD) is a fundamental micronutrient with major implications for human health. About one billion persons worldwide have been reported to have VitD deficiency or insufficiency. [13] The prevalence of VitD deficiency in the general population is considerable and varies by ethnic background, sunlight exposure, and the presence of risk factors such as age, obesity, type 2 diabetes mellitus (T2DM), and other comorbidities. [14,15] At the community level, 40-100% of the elderly population in Western countries is VitD insufficient or deficient, with more in Asia and Africa. [13,14] Hence, this study was conducted to evaluate Serum Vitamin D Level in Non-obese Patients with Type 2 Diabetes.

In the present study, Mean age of the diabetic patients and healthy controls was 45.2 years and 41.9 years respectively. Majority proportion of patients of both the study groups were males. Mean serum vitamin D levels among diabetic patients and healthy controls was 15.3 ng/mL and 28.1 ng/mL respectively. While comparing the results statistically, significant results were obtained. A study by Yu JR et al, aimed to evaluate the relationship between the serum 25-hydroxyvitamin D [25(OH)D] level and various parameters in patients with T2DM. We analyzed retrospectively data from 276 Korean patients with T2DM whose serum 25(OH)D level was measured in the hospital. Nondiabetic healthy subjects who visited the hospital for health screening were selected as the control group (Non-DM, n=160). Compared with control subjects, patients with T2DM had a lower serum 25(OH)D level (15.4±0.5 vs. 12.9±0.4 ng/ml, $p<0.01$). Eleven percent of T2DM patients were VitD "insufficient" (20-29 ng/ml) and 87% of the patients were VitD "deficient" (<20 ng/ml). The serum 25(OH)D level was significantly related to serum fibrinogen, triglyceride (TG), low-density lipoprotein cholesterol (LDL-C), ferritin, the urine albumin creatinine ratio, and hemoglobin A1C (HbA1C). In a multivariate logistic regression analysis, high levels of HbA1C, TG, and LDL-C were independently associated with VitD deficiency in T2DM patients. The results of the study showed that the majority of Koreans with T2DM are VitD deficient, and the serum 25(OH)D level in patients with T2DM is related to lipid and glucose parameters. [16]

Another study by Sheth JJ et al, aimed to examine whether 25-hydroxyvitamin D (25OHD) has clinically significant influence on hemoglobin glycation (HbA1c) and insulin resistance (HOMA-IR) in T2DM subjects. The study was carried out in 912 subjects (429 T2DM cases and 483 non-diabetic controls) from Western India. The enrolled study subjects were investigated for biochemical parameters like FBS, PPBS, HbA1c, FI, HOMA-IR and 25OHD levels in blood. Vitamin D deficiency was seen in 91.4% and 93.0% of T2DM cases and control subjects respectively. There was no association of serum 25OHD deficiency on HbA1c or HOMA-IR in T2DM cases ($p = 0.057$ & $p = 0.257$ respectively) and in control subjects ($p = 0.675$ & $p = 0.647$ respectively). The findings suggests that though vitamin D deficiency is prevalent in T2DM and non-diabetic subjects, its role in hemoglobin glycation and insulin resistance could not be established. [17]A review study by George et al. again argued against vitamin D supplementation for improving glycemic control and insulin resistance in T2DM and non-diabetic subjects. [18] Moreover, a recent study by Al-Shoumer et al. demonstrated the prevalence of vitamin D deficiency in insulin resistant T2DM and normal subjects, where insulin resistance was not found to be influencing the status of vitamin D. [19] Haidari F et al, investigated the association between serum 25(OH)D and glycemic and inflammatory markers in non-obese patients with T2DM. Eighty-four non-obese patients with T2DM were recruited in this cross-sectional study. Demographic, anthropometric, and dietary information was obtained from all the participants. The serum concentrations of glucose, HbA1C, insulin, 25(OH)D, and inflammatory markers including tumor

necrosis factor-alpha (TNF-α) and high sensitive C-reactive protein (hs-CRP) were measured. A homeostatic model of insulin resistance (HOMA-IR) was also evaluated. The mean serum concentration of 25(OH)D was 11.01±5.55 ng/mL. Severe deficiency, deficiency, and insufficiency of vitamin D were detected in 60.71%, 35.72%, and 3.57% of the participants, respectively. The results showed that those in the lowest group of serum 25(OH)D had significantly higher TNF-α than did those in the highest group (P=0.026). Although the association between serum 25(OH)D and fasting blood sugar and TNF-α was statistically significant (P=0.049 and P=0.044, respectively), the other glycemic markers and hs-CRP did not have any significant relationships with 25(OH)D. According to the high prevalence of vitamin D deficiency in the diabetic patients and the inverse relationship between serum 25(OH)D and fasting blood sugar and TNF-α in this study, vitamin D status may be a determining factor of systemic inflammation in patients with T2DM. Further studies with larger sample sizes are suggested in this regard. [20] Vitamin D receptors have been found in pancreatic beta cells, which additionally have been found to express the enzyme 1-α-hydroxylase. [21] Vitamin D facilitates the secretion of insulin from pancreatic beta cells, thus appearing to regulate insulin secretion. [22] Therefore vitamin D deficiency may be related to impaired insulin secretion in diabetes mellitus type 2.

CONCLUSION

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