Review Article

Vitamin D role in Bone Mineral Density of Type 2 Diabetes

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Abstract:
Objectives: Determine whether a low serum concentration of 25-hydroxyvitamin D, which responsible for bone and calcium metabolism, was associated with type 2 Diabetes.
Study Design: Prospective observational study
Setting: Therapeutic clinic, Azerbaijan Medical University, Baku.
Subjects and intervention: Total 72 patients with type 2 diabetes major more than 45 years of age were included in investigation.
Study period: 7 October 2015 to 22 September 2016
Results: Lower levels of 25(OH)D3 was associated with less good glycemic control in type 2 diabetes mellitus patients. 25(OH)D3 had a negative correlation with HOMA-IR (p<0.001). HOMA-IR and fasting insulin values were lower with higher mean 25(OH)D3 concentrations. Lower serum 25(OH)D3 concentrations also increase serum parathyroid hormone (PTH). At levels <20 ng/ml, 25(OH) D had a negative correlation with PTH (p<0.01). Plasma osteocalcin (OC) concentration, a marker for osteoblastic activity, was markedly lower in diabetic rats than in nondiabetic (8.2±0.7ng/ml vs 29.5±1.4ng/ml; p<0.05).
Conclusion: Vitamin D possibly plays a role in formation glucose homeostasis. There is a negative correlation between serum levels of vitamin D and insulin resistance. In consequence, this findings demonstrated that vitamin D concentration in diabetic patients was obviously lower in comparison to non-diabetic individuals.

Keywords: 25-hydroxyvitamin D3, bone complications, type 2 diabetes mellitus

INTRODUCTION:
Deficiency of vitamin D has been associated with both types of diabetes (DM) and with metabolic syndrome [1]. Studies suggest that vitamin D may play a role in increase of the risk of DM [2]. The role of vitamin D deficiency in insulin resistance have several potential mechanisms, including increasing the formation of proinflammatory cytokines and acute phase reactants, likely to increase low-grade inflammation, known as promotion of insulin secretion from beta-cells [3,4]. This is evidence of a role for vitamin D in regulating blood glucose levels, the obvious question is whether vitamin D can prevent, cure, or treat diabetes. Because vitamin D is present in the insulin-producing beta cells, and insulin secretion is calcium and therefore indirectly vitamin D dependent, it is hypothesize that vitamin D has a direct effect on how much insulin the body makes [5]. The study results show that vitamin D levels were more closely linked to blood sugar levels than BMI [6]. Vitamin D may affect glucose homeostasis, and having been found to be inversely related to glycosylated hemoglobin levels in diabetics mellitus [7].

METHODOLOGY:
Investigated 72 patients with type 2 diabetes (44 Female:28 Male). Participants’ weights and heights were recorded, and body mass index (BMI) was calculated. The same measurements were performed in 32 healthy individuals as control group subjects of the same age and sex(18Female:14Male). Serum concentrations of 25-hydroxyvitamin D3 (25(OH)D3), glycated hemoglobin A1c (HbA1c), fasting blood glucose (FBS), fasting insulin (FINS), fasting serum C-peptide, intact parathyroid hormone (PTH), urea nitrogen (BUN), serum creatinine (SCR), serum calcium (Ca), and serum phosphorus (P) were determined by the immune-pherment method.
Bone mineral density (BMD) measurement derived from T-scores of the hip and lumbar spine by dual-energy-x-rayabsorptiometry (DEXA) and biochemical markers of bone metabolism, including calcium, PTH,
osteocalcin, and serum bone-specific alkaline phosphatase, serum beta-CrossLaps, urinary pyridiniumcross-links (free deoxypyridinoline).

Bone mineral density (BMD) investigate by means of DEXA (dual-energy X-ray absorptiometry) and derived from T-scores of the hip and lumbar spine. The lumbar spine densitometry measurement included the lumbar vertebrae L1- L4. Osteopenia was defined as a T-score between -1 and -2.5 at the lumbar spine or hips and osteoporosis was defined as a T-score < -2.5.

RESULTS:
The mean age of the case group was 59.2±8.73 and in control group was 56.8±7.68 years old. Mean BMI in the diabetic and control groups was 30.1 ± 5.2 and 28.2 ± 6.5 kg/m^2, respectively. The average duration of diabetes in the diabetic group was 12.35±6.12 years, HbA1c – 9.65±2.15%.

Vitamin D [25(OH)D3 values] levels were lower in type 2 diabetes mellitus patients than in the control group, being 20.34±2.86 ng/ml vs 28.54±1.04 ng/ml,(p<0.001).

Mean serum 25(OH)D3 concentrations were higher in men than in women (21.89±2.74 vs 19.32±1.53 ng/ml; p = 0.025). The mean concentration of 25(OH)D3 in male subjects in both groups was no so significant, but in women with diabetes was significantly less than the healthy women (19.32±1.53ng/ml vs 27.05±1.81 ng/ml; p=0.0001).

Totally in diabetic patients, Vit-D level was deficient in 49 patients (68%), insufficient in 18 (25%) patients and sufficient in 8 (7%) patients sufficient.

25(OH)D3 levels were found to be inversely associated with HbA1c levels in the diabetic patients (p=0.008). Lower levels of 25(OH)D3 was associated with less good glycemic control in type 2 diabetes mellitus patients[1, 2]. 25(OH)D3 had a negative correlation with HOMA-IR (p<0.001). HOMA-IR and fasting insulin values were lower with higher mean 25(OH)D3 concentrations.

The values for serum 25(OH)D3, HOMA-IR, fasting blood glucose, and fasting insulin levels were not significantly different in male and female subjects, but the mean HbA1c was significantly higher in men than that in women.

Lower serum 25(OH)D3 concentrations also increase serum parathyroid hormone (PTH). At levels <20 ng/ml, 25(OH) D had a negative correlation with PTH (p<0.01). Plasma osteocalcin (OC) concentration, a marker for osteoblastic activity, was markedly lower in diabetic rats than in nondiabetic (8.2±0.7ng/ml vs 29.5±1.4ng/ml; p<0.05).

CONCLUSIONS:
The results of this study demonstrated that there was a statistical difference between vit D concentration in diabetic patients and the healthy subjects [8,9]. Vitamin D possibly plays a role in formation glucose homeostasis [10]. There is a negative correlation between serum levels of vit D and insulin resistance. In consequence, this findings demonstrated that vit D concentration in diabetic patients was obviously lower in comparison to non-diabetic individuals. According to the high prevalence of vit D deficiency in diabetic patients, treating with vit D may be useful and seems to be necessary.

REFERENCES


