Supplementation of Vitamin D in Diabetic Patients

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Abstract

Background: Nearly 30 percent to 50 percent of people are estimated to have deficiency of vitamin D, and insufficiency and vitamin D deficiency are recognized as global health issues in the world. Although the presence of hypo-vitamin D raises the risk of rickets and fractures, higher levels of vitamin D are also associated with hypertension (HTN), cardiovascular disease (CVD) and cancer. In addition, the vitamin D levels are also associated with diabetes mellitus (DM) and chronic kidney disease (CKD). Deficiency of vitamin D was linked to DM induction and progression. While the relationship between vitamin D and insulin secretion, insulin tolerance, and β-cell dysfunction is highlighted in patients with DM, evidence of vitamin D and DM levels is inconsistent, and well-controlled studies are required.

Aim: Supplementation of vitamin D in diabetic patients.

Material and Method: The study included 50 patients were given vita D supplement and 50 subjects were not given vita D supplement in diabetic people as the control group. Directly Observed Treatment in the Department of Clinical Biochemistry, Datta Meghe Medical College, SMHRC, Nagpur in collaboration with JNMC, ABVRH (Datta Meghe Institute of Medical Sciences Deemed To Be University), Sawangi, Wardha, Maharashtra.

Conclusion: This study evaluated that vitamin D supplementation can improve HbA1c, insulin resistance, and insulin in short-term intervention in T1DM & T2DM patients, suggesting that vitamin D can be considered as a therapeutic agent along with the other T1DM & T2DM treatments. The findings show that in non-additional diabetic patients, vit D concentration was substantially lower than the additional diabetic individuals.

Keywords: *Vitamin D,HbA1c,CKD, T1DM & T2DM.*

Introduction

Diabetes mellitus [DM] is one of the most common disease around the world, and their occurrence continues to increase[1]. Type 2 diabetes is portrayed by weakened pancreatic b-cell function, insulin resistance, and systemic inflammation [2] and there is proof that vitamin D regulates these mechanisms.[3] Vitamin D may directly affect β-cell function mediated by binding of the circling dynamic structure, 1,25-dihydroxyvitamin D [1,25(OH)2D], to the vitamin D receptor, which is expressed in pancreatic β-cells [4,5].

Low vitamin D levels have been recognized globally as a major health issue. Current literature provides evidence that hypovitaminosis D is associated with different health conditions, including bone health,

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cardiovascular disease, hypertension, cancer risk and diabetes mellitus. In particular, higher prevalence of low serum vitamin D [25-(OH)D] levels was observed in patients with type 2 diabetes whereas higher levels of vitamin D [25-(OH)D] were associated with lower risk of type 2 diabetes (T2DM)[6,7].

The International Diabetes Federation reports that there are about 285 million people with diabetes worldwide, or 7 per cent of the world's population. This figure is projected to reach 435 million by 2030.[7] An estimated 79 million people in the United States have pre-diabetes[7,8].

The following are recommendations for vitamin D in the DRIs developed by the Food and Nutrition Board at the Institute of Medicine. DRI is the general term for a set of reference values used to plan and assess the nutrient intake of healthy people.

Table 1: Current DRI Recommendations for Vitamin D[9]

DRIs for vitamin D	
Infants	
0–6 months	AI: 400 IU [10 µg/day]
7–12 months	AI: 400 IU [5 µg/day]
Children	
12-36 Months	600 IU [15 µg/day]
48 to 96 Months	600 IU [15 µg/day]
Older Children and Adults	
9 to 70 years	600 IU [15 µg/day]
Adults > 70 years	800 IU [20 µg/day]
Pregnancy and lactation:	600 IU [15 µg/day]

Material and Method

50 diabetic patients who referred to the clinics of Department of Clinical Biochemistry, Datta Meghe Medical College, SMHRC, Nagpur in collaboration with Jawaharlal Nehru Medical College, AVBR Hospital Sawangi, Wardha were selected as case group and 50 healthy subjects [as control group] were evaluated. Inclusion criteria were patients whose diabetes was confirmed and were between 30-60 years old and agreed to participate in this study. Exclusion criteria were: use any drugs consisting of vitamin D, any disorder except diabetes such as osteomalacia, osteoporosis, inflammatory rheumatism and patients treated with corticosteroids, using drugs which interfere with vitamin D metabolisms such as carbamazepine, phenobarbital, sodium valporate, gabapentin, isoniazid, mineral oil and calcitonin. The control group was selected as the normal population subjects.

According to season changes in Vitamin D level, all samples were collected in one season. Vitamin D level was measured with quantitative ELISA. Vitamin D deficiency was defined as serum 25(OH) D concentration of less than 20ng/ml, insufficiency as 20ng/ml <25(OH) D<30 ng/ml and sufficiency was defined as 25(OH) D higher than 30 ng/ml. The data were collected and analyzed. To determine the differences in vitamin D levels, in both groups we used t-test. A p-value less than 0.05 were considered significant.

Result

25 males and 25 females were enrolled in each group. The mean concentration of vit D in diabetic patients was 15.7±9.5 ng/dl and in the non supplementary diabetic patients was 12.2±6.5 ng/dl. The mean concentration of vit D in diabetic male patients was 10.04±6.4 and in non supplementary diabetic male patients was 8.23±2.6 ng/dl (p=0.219). The mean concentration of vit D in women with diabetes was 11.3±7.3 and in non supplementary diabetic women was 9.03±2.28 ng/dl.

Table 2: Vit-D levels in the case and in the control group

	Supplementary Diabetic Patients [study group]	Non Supplementary Diabetic Patients [control group]
Male	10.04±6.4 ng/dl	8.23±2.6 ng/dl
Female	11.3±7.3 ng/dl	9.03±2.28 ng/dl
Total	**15.7±9.5 ng/dl**	**12.2±6.5 ng/dl**

In the non supplementary diabetic group [control group], 34 patients had a deficiency of Vit-D, 10 patients with insufficiency of vit D and 6 patients had sufficiency of vit D.

Discussion

The results of this study showed that there was a statistical difference between vit D concentration in supplementary diabetic patients and the non supplementary subjects. Insufficiency of vit D in two groups also had higher prevalence[7,10,11]. Need et al. showed that the patients who had higher levels of vit D concentration had lower FBS in comparison with

the other groups. These results were similar to our findings[11].

Other study that was performed by Daga et al. in the North of India demonstrated that 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. Different diets in two groups were considered this difference. [12]

Gagnon et al. found that the mean serum concentration of vit D in diabetic patients was lower than the non-diabetic individuals[12,13]. These results were almost similar to the findings of our study.

The weakness of this study is that we did this study only in one season and because of sunshine duration difference in each season level of vitamin D may undulate during the year, so this study cannot predict the condition of hypovitaminosis in this area.

Conclusion

Our findings demonstrated that vit D concentration in non supplementary diabetic patients was significantly lower in comparison to supplementary diabetic individuals. According to the high prevalence of vit D deficiency in this group, treating with vit D supplements maybe useful and seems to be necessary.

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

References

1. Narayan K et al. Impact of recent increase in incidence on future diabetes burden:U.S., 2005-2050. Diabetes Care 2006; 29: 2114-2116.
2. Hu Fet al. Inflammatory markers and risk of developing type 2 diabetes in women. Diabetes. 2004; 53[3]:693–700.
3. Lillioja S et al. Insulin resistance and insulin secretory dysfunction as precursors of non-insulin dependent diabetes mellitus: prospective studies of Pima Indians.NEngl J Med. 1993;329[27]:1988–1992.
4. Johnson Jet al. Immunohistochemical localization of the 1, 25[OH]2D3 receptor and calbindin/D28k in human and rat pancreas. Am J Physiol. 1994;267[3 Pt 1]:356–360.
5. Christakos S, Norman A. Studies on the mode of action of calciferol: XVIII. Evidence for a specific high affinity binding protein for 1, 25 dihydroxy vitamin D3 in chick kidney and pancreas. Biochem Biophys Res Commun. 1979;89[1]:56–63.
6. Al Thani et al. The effect of vitamin D supplementation on the glycemic control of pre-diabetic Qatari patients in a randomized control trial. BMC Nutrition [2019] 5:46
7. Kamble A, Ambad R et al. To study the effect of oral vitamin D supplements on wound healing in patient with diabetic foot ulcer and its effect on lipid metabolism. Int. J. Res. Pharm. Sci., 2020, 11(2), 2701-2706.
8. Nakade M et al. Status of Vitamins and Minerals in Pregnancy: Still A Point of Concern in Central India. Int J Cur Res Rev. 2020; 12(14): 45-49.
9. Ambad R et al. Polyherbal antidiabetic drug: An approach to cure diabetes. Int. J. Res. Pharm. Sci., 2020, 11(2), 2679-2683.
10. Ambad R et al. Relationship between uric acid and creatinine in pre-diabetic and diabetic patients: Vidarbha region of Maharashtra. Int. J. Res. Pharm. Sci., 2020, 11(3), 3412-3417.
11. Need A et al. Relationship between fasting serum glucose, age, body mass index and serum 25 hydroxyvitamin D in postmenopausal women. Clin Endocrinol [Oxf] 2005; 62: 738-41
12. Daga R et al. High prevalence of vitamin D deficiency among newly diagnosed youth-onset diabetes mellitus in north India. Arq Bras Endocrinol Metabol 2012; 56: 423-8.
13. Gagnon C et al. Serum 25-hydroxyvitamin D, calcium intake, and risk of type 2 diabetes after 5 years: results from a national, population-based prospective study [the Australian Diabetes, Obesity and Lifestyle study]. Diabetes Care 2011;34: 1133-8