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Original Research Article

Role of Vitamin D as an Add-on Therapy to Oral Hypoglycemic Drugs in the Management of Type-2 Diabetic Patients

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Abstract

Background: New cases of Type 2 DM are increasing worldwide in every nation, with 80% of affected people living in developing countries. Therefore, Type 2 DM has become a very serious public health problem with a huge socio-economic burden for each country, but developing countries like India bear the highest burden.

Aims and Objectives: The aim of the study was to evaluate the role of vitamin D as an add-on to oral hypoglycemic drugs in the treatment of Type 2 diabetic patients.

Method and Materials: The present case-control study was conducted on 80 (Eighty) Type 2 Diabetes mellitus patients attending the OPD of General Medicine in collaboration with the Department of Physiology and Department of Biochemistry, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India. The patients are divided into two groups- a control group (n = 40) of Type 2 Diabetic patients on oral hypoglycemic drugs without vitamin D supplementation and a study group (n = 40) of Type 2 Diabetic patients on oral hypoglycaemic drugs with vitamin D supplementation.

Results: The mean age of the patients was 42.17±9.50 years in the control group and 46.39±9.93 years in the study group. Vitamin D supplementation shows improvement in glycaemic parameters like FBS, PPBS, and HbA1c values over a 3 months period.

Conclusion: The present study indicating that Vitamin D supplementation improves glycemic control, thereby delaying the progression and consequently the complications of Type 2 DM in patients with Vitamin D deficiency.

Keywords: Type 2 Diabetes mellitus, Vitamin D supplementation, Glycaemic control.

Introduction

Type 2 diabetes mellitus (T2DM) is one of the nonskeletal diseases related to a vitamin D deficiency. Both T2DM and vitamin D deficiency have similar risk factors, such as obesity, ageing, and a sedentary lifestyle. Cardiovascular diseases (CVDs) and metabolic syndrome disorders are also associated with vitamin D deficiency. Vitamin D plays an important functional role in glucose homeostasis through its effects on insulin secretion and sensitivity. It may reduce insulin resistance (IR) indirectly through its effect on calcium and phosphate metabolism and through up regulation of the insulin receptor gene [1]. New cases of Type 2 DM are increasing worldwide in every nation, with

80% of affected people living in developing countries. Therefore, Type 2 DM has become a very serious public health problem with a huge socio-economic burden for each country, but developing countries like India bear the highest burden [2]. There is enough evidence to suggest that Vitamin D plays a vital role in many non-skeletal disorders, including Type 2 DM [3]. Specific vitamin D receptor gene polymorphisms have been found to be related to components of the metabolic syndrome. Moreover, vitamin D seems to affect glucose homeostasis; vitamin D levels have been found to be inversely related to glycosylated haemoglobin levels in gestational diabetes mellitus [4]. However, vitamin D deficiency seems to be related to an increased risk of the development of gestational diabetes mellitus [5]. The development of type 2 diabetes mellitus appears to be related to vitamin D deficiency [6]. Mild to moderate vitamin D insufficiency has been proposed as a risk factor for type 2 diabetes [6]. Higher plasma vitamin D levels have been shown to be related to a lower risk of the development of diabetes mellitus in high-risk patients [7]. Additionally, vitamin D levels have been reported to be inversely associated with glycosylated haemoglobin levels in gestational diabetes mellitus, suggesting that vitamin D might affect glucose homeostasis [8]. It has been observed in various studies that the risk of Type 2 diabetes is increased in those with low Vitamin D levels and that the addition of Vitamin D improves glucose tolerance and decreases insulin resistance [9].

Aims and Objective

The aim of the study was to evaluate the role of vitamin D as an adjuvant to oral hypoglycaemic drugs in the treatment of Type 2 diabetic patients.

Material and Methods

The present case-control study was conducted on 80 (Eighty) Type 2 Diabetes mellitus patients attending the OPD of General Medicine in collaboration with the Department of Physiology and Department of Biochemistry at Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India. The duration of the study was seven months, from May 2022 to November 2022. The patients are divided into two groups- a control group (n = 40) of Type 2 Diabetic patients on oral hypoglycemic drugs without vitamin D supplementation and a study group (n = 40) of Type 2 Diabetic patients on oral hypoglycemic drugs with vitamin D supplementation. The patient was asked to fill out a proforma with details about themselves, including their name, age, sex, and socioeconomic situation, as well as relevant information about their history of diabetes mellitus, such as the duration that they've had it, whether there have been any problems, the medications they've received, etc. Institutional Ethical Committee clearance was obtained before the commencement of the study. All the eligible patients underwent both routine and specific investigations on the first visit (day 0). For 12 weeks, the study group was given 60,000 IU of vitamin D orally. At the end of the therapy (after 12 weeks), patients underwent both routine and specific investigations and were compared to the baseline (day 0). In a two-step process, levels of 25 (OH) D3 were assessed using radioimmunoassay (RIA). Using high-performance liquid chromatography (HPLC), HbA1c levels were assessed.

Inclusion Criteria

The study included participants with a confirmed diagnosis of Type 2 DM without complications who were over the age of 30 but below 70, those taking oral hypoglycaemic drugs, and those with no other underlying diseases.

Exclusion Criteria

If a patient had Type 1 diabetes, was under the age of 30 or more than 70, implemented vitamin D sup plments within the past 12 weeks, had any acute or chronic comorbidity, or was eitherpregnant or breas t feeding, they were excluded from the study. All necessary laboratory tests were done on all patients.

Statistical Analysis

Microsoft Excel Sheet 15 and SPSS version 22 was used for analysing the data. In descriptive statistical analysis, quantitative variables for continuous variables were described; for categorical variables, frequency distribution, mean, standard deviation(SD), and their percentages were computed. For data that was regularly distributed, a student t-test was applied. P values below 0.05 are regarded as significant.

Results

The present cross-sectional study consists of 80 patients. The mean age of the patients was 42.17±9.50 years in the control group and 46.39±9.93 years in the study group (Figure 1).

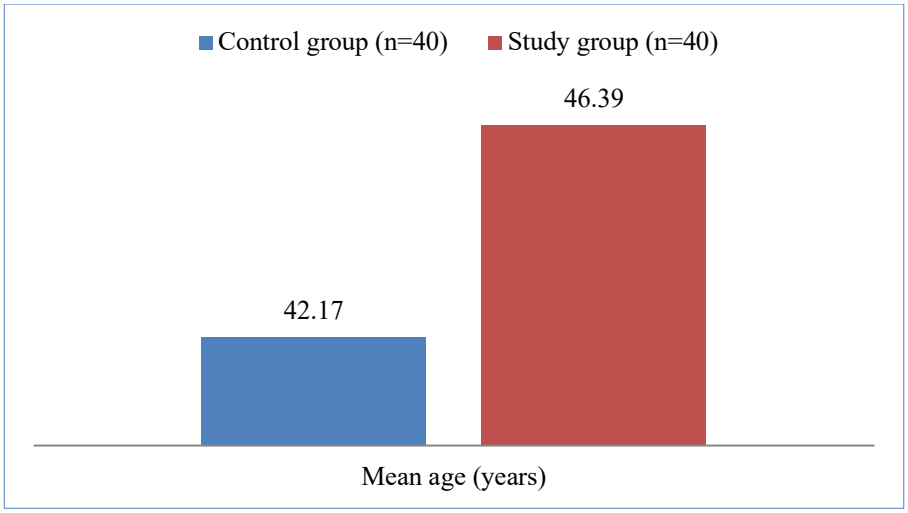

Figure 1: The mean age of control and study groups

Table 1: Comparison of general characteristics of the control and study groups before (Day 0) and after 3 months of vitamin D supplementation

Parameters	Baseline (Day 0) [Mean±SD]		Day 90 [Mean±SD]		P value
	Control group	Study group	Control group	Study group	
FBS(mg/dl)	156.91±8.05	150.21±4.23	158.74±8.39	118.72±14.89	0.001
PPBS(mg/dl)	201.90±10.96	199.89±3.65	208.10±11.06	169.50±23.56	0.002
HbA1c(gm%)	6.45±0.82	6.30±0.75	6.85±0.72	5.60±0.49	0.004
S.Creatinine (mg/dl)	0.83±0.35	0.99±0.28	0.89±0.52	1.02±0.35	2.90
SGOT(IU/L)	25.96±8.41	24.08±6.68	27.69±8.53	27.63±6.68	3.52
SGPT(IU/L)	30.97±12.34	35.72±11.79	37.73±12.65	36.42±10.50	1.03

FBS: fasting blood sugar; PPBS: postprandial blood sugar; HbA1c:glycated haemoglobin; SGOT: Serum glutamic oxaloacetic transaminase; SGPT: Serum glutamic pyruvic

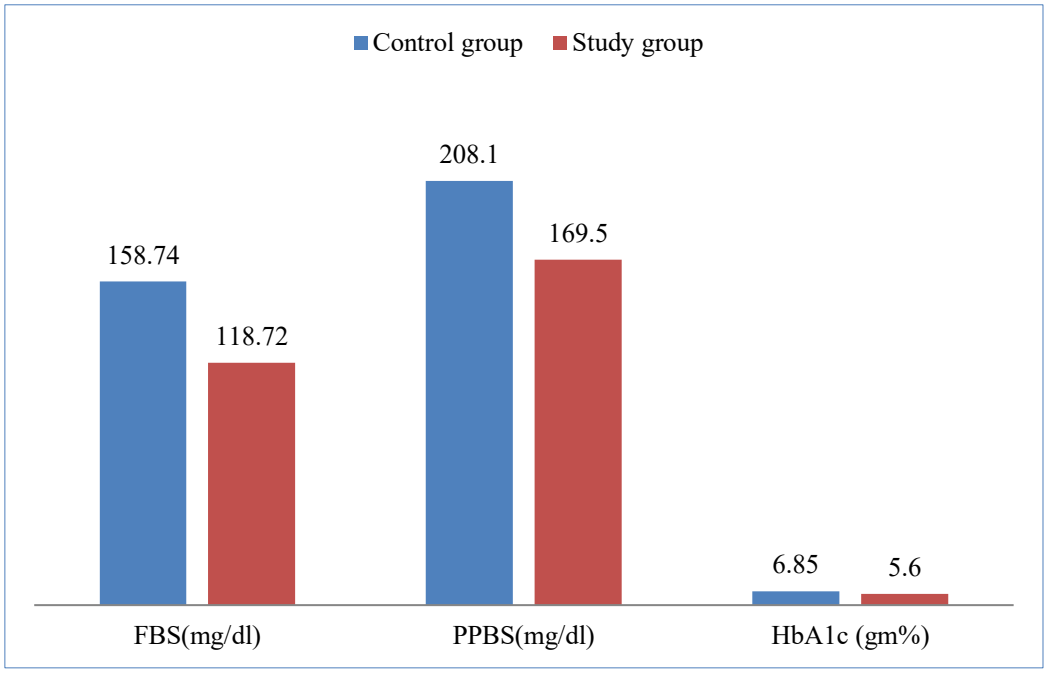

Figure 2: Comparison of glycemic parameters at Day 90 after Vit D as an add-on therapy to oral hypoglycemic drugs

As shown in Table 1 and graph 2, comparison of mean FBS, PPBS, and HbA1c values before and after 3 months of Vitamin D supplementation. Vitamin D supplementation shows improvement in glycemic parameters like FBS, PPBS, and HbA1c values over a 3 months period. Other parameters like Serum creatinine, serum glutamic oxaloacetic transaminase, and serum glutamic pyruvic transaminase showed slight changes in the study group as compared to the control group from baseline (0 days) to 3 months (Day 90), respectively.

Discussion

A total of 80 patients with Type 2 diabetes with Vitamin D deficiency not controlled on various oral antidiabetic drugs were included in the study. They were given a Vitamin D3 sachet of 60,000 IU weekly for 12 weeks orally, and then their glycemic parameters was compared with baseline values. The findings of this study indicate that the metabolic profile of Type 2 Diabetic patients in the study group improved over a period of 3 months as compared to the control group, suggesting that vitamin D correction is a promising cardio-protective intervention in vitamin D-deficient populations. The results of the present study showed that 12 weeks of vitamin D supplementation reduced FBG and HbA1C significantly in Vitamin D-deficient Type 2 diabetics. The effects of Vitamin D supplementation on glucose homeostasis have been shown in numerous studies. The findings of the current study were in agreement with those of many other studies in which vitamin D implementation resulted in a reduction in FBG and HbA1C. Talaei et al.[9], conducted a before and after study on 100 Type 2 DM patients and concluded that there was significant improvement in FBG levels after treatment with 50,000 IU of Vitamin D for 8 weeks. Lalitha et al. [10], showed a significant reduction in HbA1C values in Vitamin D-deficient Type 2 diabetics who were treated with Vitamin D as compared to those not on Vitamin D supplementation. According to Nasriet al.[11], vitamin D supplementation had a positive impact on glycemic parameters in Type 2 DM male patients. There were also studies that did not show a reduction in glycemic parameters in patients with Type 2 DM when supplemented with Vitamin D [12].

In a recent meta-analysis conducted by Haroonet al. [13], it was found that Vitamin D supplementation improved glycemic control in various short-term studies (3 months) as compared to long-term studies (6 months), which showed no improvement in glycemic parameters.

A group of Iranian Type 2 diabetics was not able to achieve the same improved metabolic profile in an earlier study by Eftekhari and colleagues, which was likely because of a shorter supplementation period (12 weeks) [14]. Other studies also found no improvement in insulin sensitivity after a high-dose vitamin D intervention. Because the subjects reported being in good health, this was probably partly caused by the supplements [15]. Increased insulin resistance post-supplementation was observed in a cohort of middle-aged adults and increased insulin sensitivity in first-time GDM patients [16].

Also maintain serum creatinine, serum glutamic oxaloacetic transaminase, and serum glutamic pyruvic transaminase. No adverse reactions or evidence of Vitamin D toxicity were noted during or after Vitamin D supplementation in the current study, which may be because only patients who were Vitamin D deficient were included in it. Vitamin D supplementation was given for a period of 3 months.

Limitation of study

The sample size of study was small and Short follow-up period

Conclusion

The results of the present study indicating that vitamin D is an adjuvant to oral hypoglycemic drugs in treatment of diabetic patients establish that Vitamin D supplementation improves glycemic control, thereby delaying the progression and consequently the complications of Type 2 DM in patients with Vitamin D deficiency, so supplementation with Vitamin D is a promising adjuvant therapy in these patients.

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Reference

1. Nada AM and Shaheen DA. Cholecalciferol improves glycemic control in type 2 diabetic patients: a 6-month prospective interventional study. Therapeutics and clinical risk management 2017;13:813-820.
2. Ramachandran A, Snehalatha C, Shetty AS, NandithaA. Trends in prevalence of diabetes in Asian countries. World J Diabetes. 2012;3(6):110-7.
3. Bikle D. Non-classic actions of vitamin D. J Clin Endocrinol Metab. 2009;94(1):26-34.
4. Schuch NJ, Garcia VC, Vivolo SR and Martini LA. Relationship between Vitamin D Receptor gene polymorphisms and the components

of metabolic syndrome. Nutrition journal 2013;12:96.
5. Kostoglou Athanassiou I, Athanassiou P, Gkountouvas A and Kaldrymides P. Vitamin D and glycemic control in diabetes mellitus type 2. Therapeutic advances in endocrinology and metabolism2013;4(4):122-128.
6. Pittas A., Lau J., Hu F., Dawson-Hughes B. (2007) The role of vitamin D and calcium in type 2 diabetes. A systematic review and meta-analysis. J Clin Endocrinol Metab 92: 2017–2029
7. Pittas A., Nelson J., Mitri J., Hill mann W., Garganta C., Nathan D., et al. (2012) Plasma 25-hydroxyvitamin D and progression to diabetes in patients at risk for diabetes: an ancillary analysis in the Diabetes Prevention Program. Diabetes Care 35: 565–573 [PMC free article] [PubMed] [Google Scholar]
8. Lau S., Gunton J., Athayde N., Byth K., Cheung N. (2011) Serum 25-hydroxyvitamin D and glycated haemoglobin levels in women with gestational diabetes mellitus. Med J Aust 194: 334–337 [PubMed] [Google Scholar]
9. Talaei A, Mohamadi M, Adgi Z. The effect of vitamin D on insulin resistance in patients with Type 2 diabetes. Diabetol Metab Syndr. 2013;5(1):8.
10. Lalitha A, Tripathi MK, Sharma DW, Naveen AP, Chalam KS. Impact of treating vitamin D deficiency on blood sugar levels in patients with Type 2 diabetes mellitus and prediabetes [abstract]. JAPI. 2011;59.20.
11. Nasri H, Behradmanesh S, Maghsoudi AR, Ahmadi A, Nasri P, Rafieian-Kopaei M. Efficacy of supplementary vitamin D on improvement of glycemic parameters in patients with Type 2 diabetes mellitus; a randomized double blind clinical trial. J Renal Inj Prev. 2014;3:31-4.21.
12. Krul-Poel YH, Westra S, ten Boekel E, ter Wee MM, van Schoor NM, van Wijland H, et al. Effect of vitamin D supplementation on glycemic control in patients with Type 2 diabetes (SUNNY Trial): a randomized placebo-controlled trial. Diabetes Care. 2015;38(8):1420-6
13. Nigil Haroon N, Anton A, John J, Mittal M. Effect of vitamin D supplementation on glycemic control in patients with Type 2 diabetes: a systematic review of interventional studies. J Diabetes Metab Disord. 2015;14:3.
14. Eftekhari MH, Akbarzadeh M, Dabbaghmanesh MH and HasanzadehJ. Impact of treatment with oral calcitriolon glucose indices in type 2 diabetes mellitus patients. Asia Pacific journal of clinical nutrition2011;20(4):521-526.
15. Grimnes G, FigenschauY, Almas B and Jorde R. Vitamin D, insulin secretion, sensitivity, and lipids: results from a case control study and a randomized controlled trial using hyperglycemic clamp technique. Diabetes2011;60(11):2748-2757.
16. Al-Daghri NM, Alkharfy KM, Al-Othman A, El-Kholie E, Moharram O, Alokail MS, et al. Vitamin D supplementation as an adjuvant therapy for patients with T2DM: an 18-month prospective interventional study. Cardiovasc Diabetol 2012;11:85.