e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(9); 398-403

Original Research Article

Prospective Observational Assessment of the Role of Vitamin D as an Adjuvant to Oral Hypoglycemic Drugs in the Treatment of Type-2 Diabetic Patients

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Received: 15-07-2022 / Revised: 23-08-2022 / Accepted: 15-09-2022

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Conflict of interest: Nil

Abstract

Background: Diabetes mellitus type 2 and the metabolic syndrome seem to be related to vitamin D deficiencies. Vitamin D may affect glucose homeostasis. Vitamin D levels have been found to be inversely related to glycosylated haemoglobin levels in diabetes mellitus.

Aims and Objective: The aim of the study was to evaluate the role of vitamin D as an adjuvant to oral hypoglycemic drugs in the treatment of type 2 diabetic patients.

Materials and Methods: The study was done on 80 patients diagnosed with T2DM. Out of 80 patients were in the control group, type 2 diabetic patients on oral hypoglycemic drugs without vitamin D supplementation (n = 40), and the study group was type 2 diabetic patients on oral hypoglycemic drugs with vitamin D supplementation (n = 40).

Results: The mean age of patients was 42.25±8.60 in the control group and 45.92±8.40 in the study group. The family history of diabetes mellitus was 52 patients. HbA1C, FBG, and postprandial were decreased in the study group as compared to the control group from baseline (0 day) to 90 days, respectively. Other parameters like hemoglobin, 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 day) to 90 days, respectively.

Conclusion: The study concluded that glycemic control in type 2 diabetes mellitus is correlated with vitamin D levels and that vitamin D acts as an adjuvant to oral hypoglycemic drugs in the treatment of diabetic patients. These findings might have therapeutic implications as cautious vitamin D supplementation may improve glycemic control in diabetes mellitus type 2.

Keywords: Diabetes mellitus type 2, Glycemic control, Vitamin D

Introduction

The World Health Organization defines Diabetes Mellitus as a metabolic disorder characterised by glycosuria, hyperglycemia, hyperlipidemia, negative nitrogen balance, and sometimes ketonemia. It is a heterogeneous group of

disorders having varied etiologies.The pathophysiology involves absolute or relative insulin deficiency along with a component of insulin resistance that results from defects in insulin action, insulin secretion, or both. Hyperglycemia with alterations in the metabolism of proteins, carbohydrates, and lipids are among the distinguishing features. According to etiopathogenesis, type 1 diabetes is characterised by complete or near total insulin deficiency, whereas type 2 diabetes involves varying degrees of insulin resistance and impaired insulin secretion. Secondary diabetes is caused by other hyperglycemic conditions. Gestational Diabetes is elevated blood sugar during the second or third trimester that resolves postpartum [1]. Type 2 diabetes mellitus (T2DM) is considered one of the nonskeletal diseases related to vitamin D deficiency. Similar risk factors for T2DM and vitamin D deficiency include obesity, ageing, and a sedentary lifestyle. Vitamin D deficiency is also related to metabolic syndrome disorders and cardiovascular diseases (CVDs). Through its effects on insulin secretion and sensitivity, vitamin D plays an important functional role in maintaining glucose homeostasis. It may reduce insulin resistance (IR) indirectly through its effect on calcium and phosphate metabolism and through upregulation of the insulin receptor gene [2]. Vitamin D deficiency has been a global pandemic for a while, yet the level of attention given by the scientific and clinical community has only recently been stimulated, primarily because of the pleiotropic effects of this hormone outside the skeletal system. A deficiency in vitamin D has been consistently associated with high blood pressure, cardiovascular disease, diabetes mellitus, inflammatory bowel disease, osteoporosis, periodontal disease, stroke, multiple sclerosis, inflammatory bowel disease, osteoporosis, periodontal disease, macular degeneration, mental illness, propensity to fall, chronic pain, and various cancers[3]. In addition, vitamin D deficiency has been described in the metabolic syndrome [4], with specific vitamin D receptor gene polymorphisms having been found to be related to components of the metabolic syndrome. Moreover, vitamin D seems to affect glucose homeostasis, with vitamin D levels having been found to be inversely related to glycosylated haemoglobin levels in gestational diabetes mellitus [5]. However, vitamin D deficiency seems to be related to an increased risk of the development of gestational diabetes mellitus [6]. Additionally, we discussed the advantages of vitamin D supplementation for those with diabetes mellitus type 2 (DMT2), a common chronic non-communicable disease. Previously reported, the favourable effects of improved vitamin D status are most evident in the lipid profile of subjects, reaffirming the hypothesis that vitamin D deficiency contributes to the pathogenesis of atherogenic dyslipidemia[7].

Aims and Objective: The aim of the study was to evaluate the role of vitamin D as an adjuvant to oral hypoglycemic drugs in the treatment of type 2 diabetic patients.

Materials and Methods

This is a study that was carried out at tertiary health care centre outpatient clinics. The study was done on 80 patients diagnosed with T2DM. All patients that were enrolled gave their concent. After receiving approval from the institutional ehteical committee, the present study has been carried out in the Department of pharmacology at Nalanda Medical College & Hospital, Patna, Bihar, India in collaboration with the department of medicine, Nalanda Medical College & Hospital, Patna, Bihar, India. The Study Was Carried Out Over A Period Of 6 Months From December 2021 to May 2022. Of 80 patients, 40 were in the control group and 40 were in the study group. The patients are divided as follows:

Group A (control group, n = 40) —Type 2 diabetic patients on oral hypoglycemic drugs without vitamin D supplementation

I. Group B (study group, n = 40) - Type 2 diabetic patients on oral hypoglycemic drugs with vitamin D supplementation

All the eligible patients underwent both routine and specific investigations on the first visit. The study group (group B) was prescribed Vitamin D at 60,000 IU orally daily for 12 weeks. At the end of the therapy (after 12 weeks), patients underwent both routine and specific investigations, and their results were compared with those from the baseline (day 0).

Inclusion Criteria: Patients aged more than 30 years but less than 60 years with an established diagnosis of Type 2 DM without complications, patients on oral hypoglycaemic drugs, and patients without any concurrent illness were included in the study.

Exclusion Criteria: Patients were excluded if they had Type 1 diabetes, were less than 30 years old or older than 60 years old, had taken vitamin D in the previous 12 weeks, had any acute or long-term co-morbidity, or were pregnant or lactating. Necessary laboratory parameters were performed in all patients.

Statistical analysis: The data was entered into a Microsoft Excel sheet 16, which is used to analyse data, create graphs, and test statistically on SPSS (Statistical Package for the Social Sciences) for Windows version 22 software. Quantitative variables were described in the descriptive statistical analysis. The frequency distribution, mean± SD, and percentages for categorical variables were calculated for continuous variables. A T-test was used for normally distributed data. A p value of ≤ 0.05 is considered significant.

Results

A total of 80 patients were enrolled in this study; the mean age of patients was 42.25±8.60 in the control group and 45.92±8.40 in the study group (Graph 1).

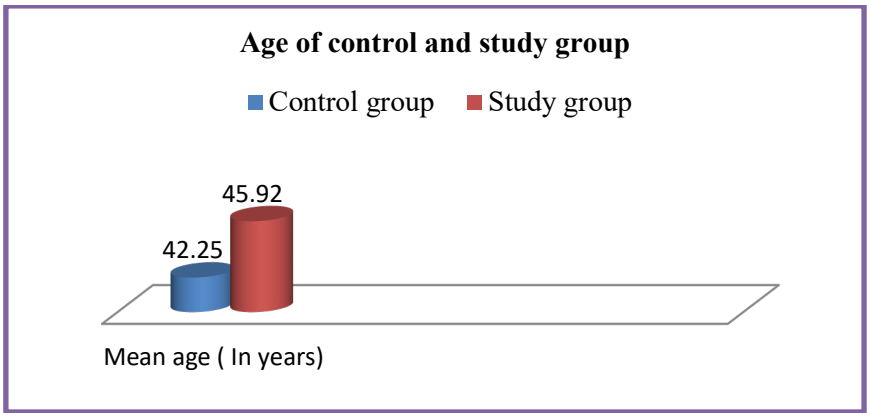

Figure 1: Age of control and study group

Table 1: General characteristic of control and study group according to follow-up on Day 0 (Mean ± SD)

Group	HBA1c (gm %)	FBS (mg/dl)	PP (mg/dl)	Hb (mg/dl)	S. Crt. (mg/dl)	SGPT (IU/L)	SGOT (IU/L)
Control	6.45±0.76	154.16±9.10	200.05±12.65	11.50±1.10	0.86±0.26	32.25±11.45	25.15±9.05
Study	6.42±0.66	150.15±4.45	198.35±5.50	11.42±1.18	0.99±0.36	35.60±10.90	24.60±8.60

Table 1 and Table 2 show the comparison of mean HbA1c (glycated hemoglobin) before and after 90 days of Vitamin D supplementation showed a reduction. With

supplementation of Vitamin D, mean FBS (fasting blood sugar) values showed a reduction over a 90-day period. Postprandial was decreased in the study group as compared to the control group from baseline (0 day) to 90 days, respectively. Other parameters like hemoglobin, 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 day) to 90 days, respectively.

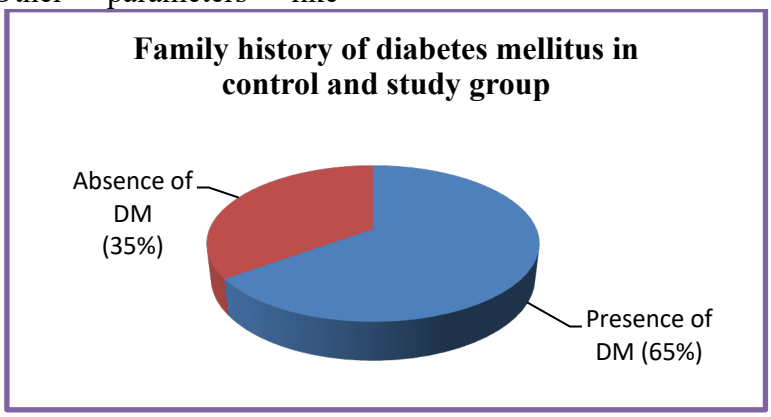

Figure 2: Family history of diabetes mellitus in control and study group

The family history of diabetes mellitus was found in 52(65%) patients (Graph 2).

Table 2: General characteristic of control and study group according to follow-up on Day 90 (Mean ± SD)

Group	HBA1c (gm%)	FBS (mg/dl)	PP (mg/dl)	Hb (mg/dl)	S. Crt. (mg/dl)	SGPT (IU/L)	SGOT (IU/L)
Control	6.85±0.72	158.46±8.80	204.05±12.05	11.54±.83	0.92±0.26	38.05±12.45	27.25±8.15
Study	5.42±0.56	120.15±20.90	168.15±5.50	11.32±1.08	1.09±0.36	37.48±10.30	27.15±7.40

HBA1c- Glycated haemoglobin, FBS- Fasting blood sugar, PP- Postprandial, Hb- Haemoglobin, S. Crt.-Serum Creatinine, SGPT- Serum glutamic pyruvic transaminase, SGOT- Serum glutamic oxaloacetic transaminase

Discussion

This study was designed to compare type 2 diabetic patients on oral hypoglycemic drugs with and without vitamin D supplementation. The findings of this study suggest that vitamin D supplementation is a promising cardio-protective intervention in vitamin D-deficient populations since the metabolic profile of T2DM patients in the study group improved over a period of 90 days compared to the control group. The findings of this study indicate that the metabolic profile of T2DM patients in the study group improved over a period of 90 days as compared to the control group, suggesting that vitamin D correction is a promising cardio-protective intervention in vitamin D-deficient populations. A total of 80 patients with Type 2 DM with Vitamin D deficiency who were not controlled on various oral anti-diabetic drugs were included in the study. They were given a Vitamin D3 sachet of 60,000 IU weekly for 12 weeks orally, and then glycemic status was compared with baseline values. The present study gives additional evidence that vitamin D supplementation benefits individuals with non-skeletal chronic diseases such as diabetes (T2DM)

and cardiovascular disease, as well as those who are deficient and at high risk. In a previous study, Eftekhari and colleagues were not able to elicit the same improved metabolic profile in an Iranian T2DM population, which was probably due to a shorter duration of supplementation (12 weeks)[8]. A high dose of vitamin D intervention didn't improve insulin sensitivity, according to other studies. Because the people seemed to be in good health, this was probably partly caused by the supplements. After supplementation, a cohort of middle-aged people showed increased insulin resistance, while patients with newly diagnosed GDM showed greater insulin sensitivity[7]. In the present study, aside from the apparent health benefits due to the rise in circulatory vitamin D levels, the apparent health benefits were shown after 90 days of administration, indicating that sustained and prolonged supplementation may be required to achieve the desired metabolic effects [9]. There are several mechanisms that support the idea that vitamin D can improve metabolic function. Even though there is sufficient data to suggest that vitamin D supplementation can independently improve cardiovascular health as a result of its significant associations with cardio metabolic risk factors in both human and animal models, including blood pressure, insulin resistance, and aortic media fragmentation, respectively [10]. Twelve (12) weeks of vitamin D supplementation in type 2 diabetics with vitamin D deficiency reduces FBG and HbA1C significantly. The effects of vitamin D supplementation on glucose homeostasis have been shown in numerous studies. The results of the present study were consistent with those of numerous other studies in which vitamin D treatment resulted in an improvement in FBG and HbA1C as well as maintaining the levels of haemoglobin, serum creatinine, glutamic oxaloacetic transaminase, and glutamic pyruvic transaminase. In a before-and-after study of 100 Type 2 DM patients, Talaei et al. found that treatment with 50,000 IU of Vitamin D for 8 weeks significantly improved FBG levels [11]. According to Nasri, [12] vitamin D supplementation improved glycemic parameters in type 2 diabetes type 1 male patients. With regard to the safety and tolerability of vitamin D, the present study found no adverse effects or clear signs of vitamin D toxicity. This finding may be related to the fact that only patients who were vitamin D deficient were included in the study and received vitamin D supplementation for a 12-week period[13]. There should be several cautions. First of all, there is no control group, and secondly, it is difficult to verify issues with quality of life. The study's limitations included the absence of a placebo control group. In addition, the low number of patients and relatively short follow-up period can also be considered limitations.

Conclusion

Finally, the study population and results indicate that vitamin D can be used as an adjuvant to oral hypoglycemic drugs in the treatment of diabetic patients. It also indicates the high prevalence of this vitamin deficiency in patients. The findings presented herein have therapeutic implications. Normal blood levels of vitamin D may aid in glycemic control in patients with type 2 diabetes mellitus. In addition, in people with a tendency to develop diabetes mellitus type 2, optimal levels of vitamin D within the blood may retard the clinical development of diabetes mellitus type 2.

References

1. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 200 4;27(suppl 1):s5-s10.
2. 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.
3. Alkharfy KM, Al-Daghri NM, Sabico SB, Al-Othman A, Moharram O, Alokail MS, et al. Vitamin D supplementation in patients with diabetes mellitus type 2 on different therapeutic regimens: a one- year prospective study. Cardiovascular Diabetol 2013;12(1):11 3.
4. Kayaniyil S, Harris SB, Retnakaran R, Vieth R, Knight JA, Gerstein HC, et al. Prospective association of 25(OH)D with metabolic syndrome. Clinical endocrinol 2014;80(4):502-507.
5. 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.
6. 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 metabolism 2013;4(4):122-128.
7. 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.
8. Eftekhari MH, Akbarzadeh M, Dabbaghmanesh MH and Hasanzadeh J. Impact of treatment with oral calcitriol on glucose indices in type 2 diabetes mellitus patients. Asia Pacific journal of clinical nutrition 2011;20 (4):521-526.
9. Grimnes G, Figenschau Y, 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. Diabetes 2011;60(11):2748-2757.
10. Vacek J L, Vanga SR, Good M, Lai SM, Lakkireddy D and Howard PA. Vitamin D deficiency and supplementation and relation to cardiovascular health. The American journal of cardiol2012;109(3):359-363.
11. Talaei A, Mohamadi M and Adgi Z. The effect of vitamin D on insulin resistance in patients with type 2 diabetes. Diabetology & metabolic syndrome 2013;5(1):8.
12. Nasri H, Behradmanesh S, Maghsoudi AR, Ahmadi A, Nasri P and 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. Journal of renal injury prevention 2014;3(1):31.
13. Naqvi S. G. Z., Fatima K., Jamal K., & Sheroze M. W. Coronavirus Disease in Pakistan: Response and Challenges from Prevention to Care. Journal of Medical Research and Health Sciences, 2020; 3(9): 1090–1094.