Original Research Article

The Effects of Calcium and Vitamin D Supplementation on Blood Glucose and Markers of Inflammation in Non Diabetic Adults

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Abstract

Introduction: Type 2 Diabetes mellitus is associated with considerable morbidity and mortality and its prevalence has been increasing globally. Present study was undertaken to see the effects of calcium and vitamin D supplementation on blood glucose and markers of inflammation in non-diabetic adults.
Aim of the study: To compare the effects of combined calcium and vitamin D supplementation versus placebo on blood glucose and markers of inflammation in non-diabetic adults.
Material and methods: 120 non-diabetic patients fulfilling the inclusion and exclusion criteria coming to OPD/wards of MGUMST, Jaipur were recruited. They were subjected to two study groups with two treatment arms, one group with normal fasting blood glucose and other group with impaired fasting blood glucose.
Results: The effects of calcium and vitamin D supplementation on fasting blood sugar and CRP were statistically significant in impaired fasting blood glucose group.
Conclusion: Supplementation with vitamin D and calcium improves blood glucose and markers of inflammation.

Key words

Calcium, Vitamin D, Diabetes mellitus, ESR, CRP.

Introduction

Type 2 Diabetes mellitus is associated with considerable morbidity and mortality, and its prevalence has been increasing globally [1]. There is accumulating evidence to suggest that altered calcium and vitamin D homeostasis may play a role in the development of Type 2 Diabetes. Despite the supporting evidence from observational studies, the results of small intervention studies with vitamin D or calcium supplementation on glucose tolerance have been inconsistent [2-6]. The purpose of the present study was to determine the effects of combined calcium and vitamin D supplementation on glucose metabolism and systemic inflammation in non-diabetic adults.

Materials and methods

The present study was conducted in Mahatma Gandhi University of Medical Sciences and Technology, Jaipur. The present study was a cross sectional study on 120 patients; meeting inclusion and exclusion criteria as mentioned below.

Inclusion criteria

- All non-diabetic adults who are ambulatory presenting in the medicine OPD or IPD with minor ailments.

Exclusion criteria

- Patients with malignancies
- Pregnancy with Chronic kidney disease (CKD) or Chronic liver disease (CLD).
- Patients who have dietary calcium intake exceeding 1500mg/day.
- Patients who fail to give the consent.
- Patients with bone altering conditions like hyperparathyroidism, nephrolithiasis, renal disease, B/L hip surgery or therapy with bisphosphonate, calcitonin, estrogen and tamoxifen in past 6 months.

After applying above inclusion and exclusion criteria, 120 patients were selected on the basis of simple random sampling method. Two study groups with two treatment arms, one group with normal fasting blood glucose and other group with impaired fasting blood glucose were created. A computer generated random number sequence was used to assign participants to either the placebo group or calcium-vitamin D supplementation group. A detailed history and thorough clinical examination was done. Blood glucose and markers of inflammation were evaluated at baseline, 3rd month and 6th month interval.

Results

Baseline ESR level in placebo group was 9.23±6.00 mm/hr and in calcium+vit D group was 11.13±6.05 mm/hr in impaired FBS group. Baseline ESR level in placebo group was 10.4±6.46 mm/hr and in calcium+vit D group was 8.93±5.84mm/hr in normal FBS group.

Baseline CRP level in placebo group was1.83±1.46 mg/dl and in calcium+vit D group was5.7±2.43 mg /dl in impaired FBS group. The CRP level difference in both groups was statistically significant. Baseline CRP level in placebo group was 2.1±2.21mg/dl and in calcium+vit D group was 2.36±2.35 mg/dl in normal FBS group.

Baseline FBS level in placebo group was113.3±7.14 mg/dl and in calcium+vit D group was114.8±6.61 mg /dl in impaired FBS group. Baseline FBS level in placebo group was 87.33±7.13mg/dl and in calcium+vit D group was76.6±7.67 mg/dl in normal FBS group (**Table – 1**).

At 3rd month follow-up ESR level in placebo group was 8.3±6.30 mm/hr and in calcium+vit D group was 8.6±4.79 mm/hr in impaired FBS group. ESR level in placebo group was 8.86±6.68 mm/hr and in calcium+vit D group was 8.66±5.91mm/ hr in normal FBS group.

At 3rd month follow-up CRP level in placebo group was 1.66±1.26 mg/dl and in calcium+vit D group was 4.53±4.22 mg /dl in impaired FBS group. The CRP level difference in both groups

was statistically significant. At 3rd month follow-up CRP level in placebo group was1.23±1.83 mg/dl and in calcium+vit D group was 1.86±1.92 mg/dl in normal FBS group.

At 3rd month follow up FBS level in placebo group was 109.8±18.47 mg/dl and in calcium+vit D group was 108.3±9.26 mg/dl in impaired FBS group. Baseline FBS level in placebo group was 85.63±7.95 mg/dl and in calcium+vit D group was 86.87±7.12 mg/dl in normal FBS group (**Table – 2**).

Table – 1: Baseline characteristics of study participants.

Parameters	Impaired FBS			Normal FBS		
	Placebo	Calcium + Vit D	p-value	Placebo	Calcium + Vit D	p-value
ESR	9.23±6.00	11.13±6.05	0.227	10.4±6.46	8.93±5.84	0.23
CRP	1.83±1.46	5.7±2.43	0.001	2.1±2.21	2.36±2.35	0.653
FBS	113.3±7.14	114.8±6.61	0.382	87.33±7.13	76.6±7.67	0.890

Table – 2: 3rd month characteristics of study participants.

Parameters	Impaired FBS			Normal FBS		
	Placebo	Calcium + vit D	p-value	Placebo	Calcium + vit D	p-value
ESR	8.3±6.30	8.6±4.79	0.8.36	8.86±6.68	8.66±5.91	0.903
CRP	1.66±1.26	4.53±4.22	0.001	1.23±1.83	1.86±1.92	0.197
FBS	109.8±18.47	108.3±9.26	0.692	85.63±7.95	86.87±7.12	0.516

Table – 3: 6th month characteristics of study participants.

Parameters	Impaired FBS			Normal FBS		
	Placebo	Calcium + vit D	p-value	Placebo	Calcium + vit D	p-value
ESR	8.36±5.49	7.23±4.25	0.40	8.0±5.49	8.13±5.23	0.23
CRP	0.93±1.02	3.96±2.51	0.001	1.2±2.17	1.53±1.88	0.528
FBS	113.9±6.52	102.5±12.82	0.001	84.1±7.01	84.2±7.24	0.724

At 6th month follow-up ESR level in placebo group was 8.36±5.49 mm/hr and in calcium+vit D group was 7.23±4.25 mm/hr in impaired FBS group. ESR level in placebo group was 8.0±5.49 mm/hr and in calcium+vit D group was 8.13±5.23 mm/hr in normal FBS group.

At 6th month follow-up CRP level in placebo group was 0.93±1.02 mg/dl and in calcium+vit D group was 3.96±2.51 mg/dl in impaired FBS group. The CRP level difference in both groups was statistically significant. At 3rd month follow-up CRP level in placebo group was 1.2±2.17 mg/dl and in calcium+vit D group was1.53±1.88 mg/dl in normal FBS group.

At 6th month follow up FBS level in placebo group was113.9±6.52 mg/dl and in calcium+vit D group was 102.5±12.82 mg /dl in impaired FBS group. The FBS level difference in both groups was statistically significant. At 6th month follow up FBS level in placebo group was 84.1±7.01 mg/dl and in calcium+vit D group was 84.2±7.24 mg/dl in normal FBS group (**Table – 3**).

Discussion

This study was intended to study the effects of calcium and vitamin D supplementation on blood sugar and markers inflammation in non-diabetic adults. In our study, positive association is found between blood sugar and CRP by calcium and vitamin D supplementation; which correlates well with other studies.

In a study by Anastassios G. Pittas, et al. [7] an interaction was found between calcium and vitamin D supplementation on fasting plasma glucose. In another study by Esmaeil Yousefi, et al. [8] similar results were obtained.

There are several studies with similar results supporting that calcium – vitamin D supplementations an important nutrient in the control of glucose homeostasis [9, 10]. Vitamin D intake decreased the prevalence of diabetes type 2 in long term [11]. One mechanism that relates vitamin D to diabetes may be its action on insulin receptor in β cells of pancreas. Vitamin D can stimulate gene expression of insulin receptor and increases glucose transport from the intestine [12]. Another mechanism is that vitamin D is involved in calcium absorption from the gut and calcium is necessary for insulin release from β cell [13, 14].

Conclusion

In our study, we found that calcium and vitamin D supplementation had beneficial effects in decreasing fasting blood sugar and markers of inflammation in non-diabetic adults.

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