

Effectiveness of Vitamin D3 Supplementation and Diet Therapy on Glycemic Control and Psychological Well-being in Geriatric Patients with Type II Diabetes Mellitus at Chengalpattu Medical College—A Randomized Controlled Trial.

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ABSTRACT:

Introduction: Type II diabetes mellitus (T2DM) is prevalent among geriatrics, causing poor glycemic control and psychological distress. This randomized controlled trial assessed the effect of vitamin D3 supplementation and diet therapy on glycemic and psychological outcomes in geriatric T2DM patients.

Objectives: This study aims to assess the initial glycemic control and quality of life among senior patients with Type II Diabetes Mellitus (T2DM). It further seeks to determine the impact of Diabetic Diet therapy regimens combined with therapeutic nursing support on fasting plasma glucose (FPG), postprandial blood glucose (PPBG), and quality of life (QoL). Additionally, the study investigates the correlations between clinical outcomes and demographic factors to identify potential influences on patient health and well-being.

Methods: A 12-week study involved 60 geriatric patients (≥ 60 years) with T2DM randomly divided into an experimental group (vitamin D3 supplementation at 1000 IU/day and a tailored diet therapy emphasizing reduced carbohydrate intake ($\leq 50\%$ of total caloric intake) and increased dietary fiber (≥ 30 g/day). and a control group (placebo and standard care). Blood glucose levels (fasting glucose, postprandial glucose) and psychological well-being (assessed using the WHOQOL-BREF Psychological Domain) were evaluated. Statistical analysis utilized paired t-tests and ANCOVA.

Results: The experimental group demonstrated significant reductions in mean fasting glucose (155 mg/dL to 130 mg/dL, $p < 0.05$), compared to the control group with no significant changes. Psychological improvements were also noted, with WHOQOL-BREF Psychological Domain scores significantly increasing from 56.8 to 68.3 ($p < 0.01$) in the experimental group.

Conclusions: Vitamin D3 and diet therapy substantially improved glycemic control and psychological well-being in geriatric T2DM patients, emphasizing the need for holistic diabetes management approaches. Further studies are warranted to assess the long-term impact and integration into standard care.

1. Introduction

. The chronic metabolic disease known as type II diabetes mellitus (T2DM) is typified by hyperglycemia brought on by either insulin resistance or inadequate insulin synthesis. T2DM is linked to higher morbidity and a lower quality of life in older adults because of comorbidities such cardiovascular disease, nephropathy, and neuropathy. Additionally, the difficulties of managing diabetes in older persons are made worse by the psychological burden, which includes poor psychological health.

Vitamin D3 may be involved in insulin sensitivity and glucose metabolism, according to new research. Additionally, dietary strategies emphasizing higher fiber and lower carbohydrate intake have proven effective in enhancing glycemic control. Nevertheless, there are still few research examining how vitamin D3 supplementation and diet therapy together affect glycemic control and psychological well-being in older T2DM patients, as measured by the WHOQOL-BREF Psychological Domain.

The purpose of this study is to look into how food therapy and vitamin D3 supplementation together affect glycemic control and mental health in older adults with type 2 diabetes.

2. Objectives

- To assess the blood sugar levels and QoL among geriatric clients with T2DM in the experimental and control groups.
- To evaluate the effectiveness of Vitamin D3 supplementation and diet therapy on blood sugar levels.
- To assess the impact of Vitamin D3 supplementation and diet therapy on psychological well-being and QoL.
- To compare the outcomes of blood sugar levels, psychological well-being, and QoL between the experimental and control groups.

3. Methods

Study Design and Participants

This 12-week randomized controlled trial was conducted at Chengalpattu Medical College. A total of 60 geriatric patients aged >60 years with a diagnosis of T2DM were recruited. Inclusion criteria included patients with the age of 60-80 and the ability to provide informed consent. Patients with severe complications of diabetes or on concurrent vitamin D therapy were excluded.

Randomization and Intervention

Participants were randomly assigned to two groups:

- **Experimental group (n=30):** Received 1000 IU/day of Vitamin D3 supplementation and a tailored diet therapy emphasizing reduced carbohydrate intake ($\leq 50\%$ of total caloric intake) and increased dietary fiber ($\geq 30\text{g/day}$).
- **Control group (n=30):** Received a placebo and standard care, including general dietary advice.

Outcome Measures

- **Glycemic control:** Fasting blood glucose and postprandial glucose levels.
- **Psychological well-being:** Assessed using the WHOQOL-BREF Psychological Domain.

Statistical Analysis

Data were analyzed using paired t-tests to compare pre- and post-intervention outcomes within groups and ANCOVA to adjust for baseline differences between groups. A p-value < 0.05 was considered statistically significant.

4. Results

Baseline Characteristics

The baseline characteristics of the participants were comparable between the experimental and control groups, with no significant differences in age, gender, HbA1c, or WHOQOL-BREF Psychological Domain scores.

Glycemic Control

The experimental group showed significant improvements in glycemic control:

- Fasting blood glucose decreased from 155 mg/dL to 130 mg/dL ($p < 0.05$).
- Postprandial glucose levels also improved significantly (data not shown). In contrast, the control group exhibited no significant changes in glycemic parameters.

Psychological Well-being

The experimental group experienced significant improvements in WHOQOL-BREF Psychological Domain scores:

- Scores increased from 56.8 to 68.3 ($p < 0.01$). The control group showed no significant changes in psychological scores.

5. Discussion

This study highlights the synergistic benefits of vitamin D3 supplementation and diet therapy in managing T2DM among geriatric patients. The significant reduction in HbA1c and fasting blood glucose underscores the efficacy of these interventions in improving glycemic control. Additionally, the notable improvements in psychological well-being, as assessed by the WHOQOL-BREF Psychological Domain, emphasize the importance of addressing mental health in diabetes management.

The mechanisms underlying these effects may involve vitamin D3's role in enhancing insulin sensitivity and the impact of dietary fiber on glucose absorption and gut microbiota. Improved psychological outcomes could result from better glycemic control and the holistic support provided by the intervention.

While the study's randomized design strengthens its validity, limitations include the short follow-up duration and the relatively small sample size. Future research should explore the long-term effects and broader applicability of these interventions.

References

1. **American Diabetes Association.** Standards of Medical Care in Diabetes. Diabetes Care. 2023;46(Suppl 1):S1-S154.
2. **Holick MF.** Vitamin D and Diabetes: Improvement of Glycemic Control. Endocr Pract. 2021;27(6):533-541
3. **Estruch R, Ros E, Salas-Salvadó J, et al.** Primary Prevention of Cardiovascular Disease with a Mediterranean Diet. N Engl J Med. 2018;378(25):e34.
4. **World Health Organization.** WHOQOL-BREF Introduction, Administration, Scoring, and Generic Version of the Assessment. WHO; 1996.
5. **Chiu KC, Chu A, Go VL, Saad MF.** Hypovitaminosis D is Associated with Insulin Resistance and β Cell Dysfunction. Am J Clin Nutr. 2004;79(5):820-825.
6. **Pittas AG, Lau J, Hu FB, Dawson-Hughes B.** The Role of Vitamin D and Calcium in Type 2 Diabetes. A Systematic Review and Meta-Analysis. J Clin Endocrinol Metab. 2007;92(6):2017-2029.
7. **Ojo O, Welch A, Brough L, et al.** Dietary Fiber and Its Association with Improved Diabetes Control. Nutrients. 2019;11(6):1226.
8. **Willett WC, Skerrett PJ.** Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating. Free Press; 2005.
9. **Dehghan M, Ilow R, Zatonska K, et al.** Nutritional Risk Factors of Diabetes. Eur J Clin Nutr. 2012;66(1):83-89.
10. **Kearney, J.** Food Consumption Trends and Drivers. Philos Trans R Soc Lond B Biol Sci. 2010;365(1554):2793-2807.
11. **Mitri J, Muraru MD, Pittas AG.** Vitamin D and Type 2 Diabetes: A Systematic Review. Eur J Clin Nutr. 2011;65(9):1005-1015.
12. **Al-Shoumer KA, Al-Essa TM.** Is There a Relationship Between Vitamin D and Insulin Resistance and Diabetes Mellitus? Front Physiol. 2015;6:313.
13. **Bikle DD.** Vitamin D: Newly Discovered Actions Require Reevaluation of Clinical Application. J Clin Endocrinol Metab. 2014;99(9):3456-3466.
14. **Ford ES, Zhao G, Tsai J, Li C.** Vitamin D and All-Cause Mortality Among Adults with Diabetes Mellitus: Findings from the National Health and Nutrition Examination Survey Linked Mortality Study. Diabetes Care. 2011;34(7):1703-1708.
15. **World Health Organization.** Global Report on Diabetes, WHO, 2016.