

THE EFFECTIVENESS OF VITAMIN D SUPPLEMENTATION IN GLYCEMIC CONTROL AND THE PREVENTION OF DIABETES MELLITUS

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RESUMO

Introduction: Type 2 diabetes mellitus (T2DM) represents a major public health issue, affecting approximately 10.5% of the adult Brazilian population, corresponding to nearly 20 million people. In this context, vitamin D has gained attention due to its potential modulatory effects on glucose homeostasis, influencing pancreatic β -cell function and insulin sensitivity. Although vitamin D deficiency has been associated with insulin resistance and an increased risk of progression to type 2 diabetes, some studies suggest that vitamin D supplementation may improve glycemic markers, such as fasting glucose and HbA1c, particularly in individuals with prediabetes. **Objective:** This study aims to analyze the effectiveness of vitamin D supplementation in glycemic control and in the prevention of diabetes mellitus. **Materials and Methods:** A systematic review of randomized controlled clinical trials was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The research question was structured using the PICO framework, focusing on patients without a prior diagnosis of T2DM, comparing vitamin D supplementation with no supplementation, and evaluating improvements in glycemic control and reduction in disease incidence. The search was carried out in the PubMed/Medline database until April 24, using filters for clinical studies published within the last 10 years, in English, and with full text available. Inclusion criteria comprised studies analyzing glycemic control (measured by C-peptide, insulin sensitivity, and effects on pancreatic cells) and supplementation with active or inactive forms of vitamin D, including patients with prediabetes. Studies involving exposure to other supplements or physical exercise interventions were excluded. The outcomes analyzed were fasting blood glucose, glycated hemoglobin (HbA1c), and insulin resistance (HOMA-IR). Risk of bias was assessed using the Cochrane Collaboration tool. **Results:** Four randomized, double-blind, placebo-controlled clinical trials were selected for data synthesis. The studies included sample sizes ranging from 54 to 2,243 participants, with vitamin D supplementation varying between daily or weekly doses and intervention durations ranging from 16 weeks to 24 months. Although supplementation consistently increased serum 25-hydroxyvitamin D levels, its direct impact on glycemic markers in individuals without diabetes was limited or absent. In prediabetic individuals, daily supplementation for 24 months did not improve insulin sensitivity or pancreatic β -cell function compared to placebo, except in a subgroup with severe vitamin D deficiency at baseline. However, in patients already diagnosed with T2DM and vitamin D deficiency, supplementation resulted in significant improvements in glycemic control, including reductions in HbA1c and fasting glucose, as well as a lower need for hypoglycemic medications. **Conclusion:** Vitamin D supplementation is effective in restoring serum vitamin D levels. However, current evidence suggests a primarily adjuvant role in metabolic control: its use is associated with significant improvement in glycemic markers (HbA1c and fasting glucose) only in patients with established type 2 diabetes mellitus and documented vitamin D deficiency. In contrast, among populations at moderate risk (prediabetes), isolated supplementation did not provide statistically significant benefits in modulating insulin sensitivity or pancreatic β -cell function. Therefore, recommending vitamin D supplementation as a universal primary prevention strategy for T2DM is not currently supported by robust evidence from randomized controlled trials.

Palavras-chave: Vitamin D Glycemic Control Type 2 Diabetes Mellitus Supplementation Insulin Resistance.