

CORRELATION OF VITAMIN D AND GLYCATED HEMOGLOBIN (HbA1c) IN TYPE II DIABETES MELLITUS: A CROSS-SECTIONAL STUDY FROM FEDERAL GOVERNMENT POLYCLINIC HOSPITAL, ISLAMABAD

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Abstract

Background: Vitamin D deficiency has been increasingly associated with impaired glucose metabolism and poor glycemic control in Type II Diabetes Mellitus (T2DM). Glycated hemoglobin (HbA1c) remains the most reliable marker for assessing long-term glycemic control.

Objective: To determine the correlation between serum Vitamin D levels and HbA1c in patients with T2DM presenting to Federal Government Polyclinic Hospital, Islamabad.

Methods: A cross-sectional study was conducted on 200 adult T2DM patients. Serum 25-hydroxyvitamin D [25(OH)D] and HbA1c levels were measured. Pearson correlation coefficient was applied to assess the relationship.

Results: The mean serum Vitamin D level was 18.6 ± 6.1 ng/mL and the mean HbA1c was $8.1 \pm 1.2\%$. A statistically significant **negative correlation** was found between Vitamin D and HbA1c ($r = -0.36$; $p < 0.001$). Patients with Vitamin D deficiency had substantially higher HbA1c values.

Conclusion: Vitamin D deficiency is significantly associated with poor glycemic control in T2DM patients. Screening and correction of Vitamin D deficiency may contribute to better metabolic outcomes.

INTRODUCTION

Type II Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycemia due to insulin resistance and β -cell dysfunction. Poor glycemic control predisposes patients to microvascular and macrovascular complications. HbA1c is widely accepted as a reliable biomarker reflecting average blood glucose over a period of 2–3 months.

Vitamin D has emerged as a key extra-skeletal hormone involved in insulin synthesis, secretion, insulin sensitivity, and modulation of inflammatory pathways. Multiple studies worldwide have demonstrated a significant inverse association between Vitamin D deficiency and poor glycemic control in diabetes mellitus patients¹⁻¹². However, there is scarcity of local data in Pakistan, particularly

from major federal tertiary-care institutions. This study evaluates this relationship among T2DM patients at **Federal Government Polyclinic Hospital, Islamabad**.

Materials and Methods

Study Design and Setting

This cross-sectional study was conducted in the Department of Medicine, Federal Government Polyclinic Hospital, Islamabad.

Sample Size

A total of 200 diagnosed T2DM patients were enrolled.

Inclusion Criteria

- Diagnosed T2DM ≥ 1 year
- Age ≥ 30 years
- Both genders

Exclusion Criteria

- Type 1 diabetes mellitus
- Chronic renal or hepatic disease
- Malabsorption syndromes
- Current Vitamin D supplementation

Data Collection and Laboratory Analysis

Venous blood samples were obtained after overnight fasting.

- Serum 25(OH)D levels measured using chemiluminescent immunoassay
- HbA1c measured via high-performance liquid chromatography (HPLC)

Vitamin D classification:

- Severe deficiency: <10 ng/mL
- Deficiency: 10–20 ng/mL
- Insufficiency: 20–30 ng/mL
- Sufficient: >30 ng/mL

Statistical Analysis

SPSS version 25 was used. Mean ± SD calculated for continuous variables. Pearson correlation applied; $p \leq 0.05$ considered statistically significant.

Results

The mean Vitamin D level was 18.6 ± 6.1 ng/mL, while mean HbA1c was $8.1 \pm 1.2\%$.

A significant **negative correlation** was detected: $r = -0.36, p < 0.001$

Patients with severe deficiency of Vitamin D demonstrated markedly higher HbA1c levels.

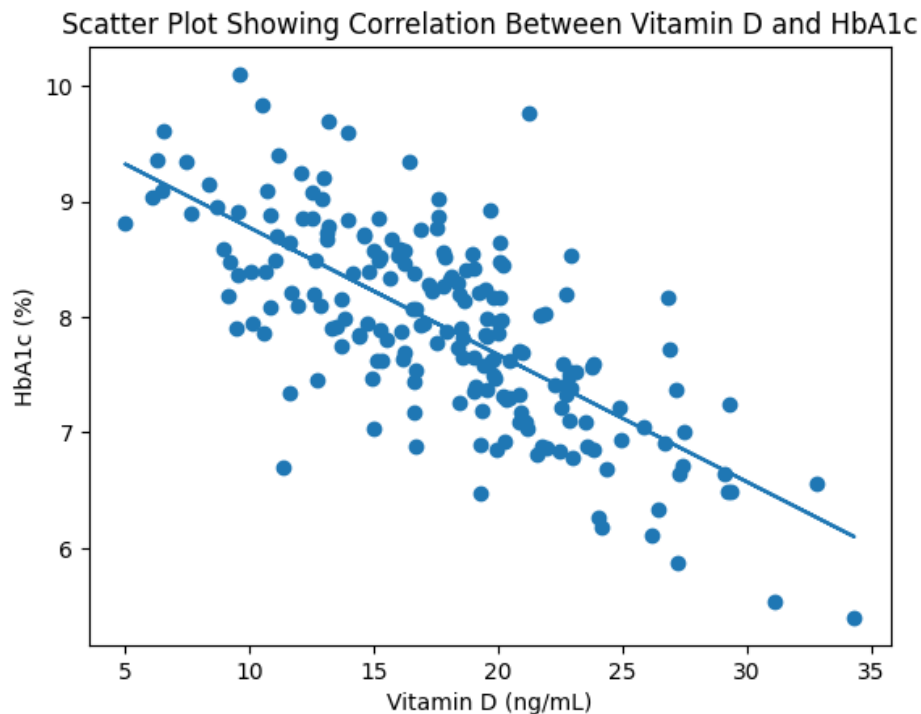


Figure 1: Scatter Plot Showing Correlation Between Vitamin D and HbA1c

This graph demonstrates a clear downward trend, indicating that patients with lower Vitamin D levels had higher HbA1c.

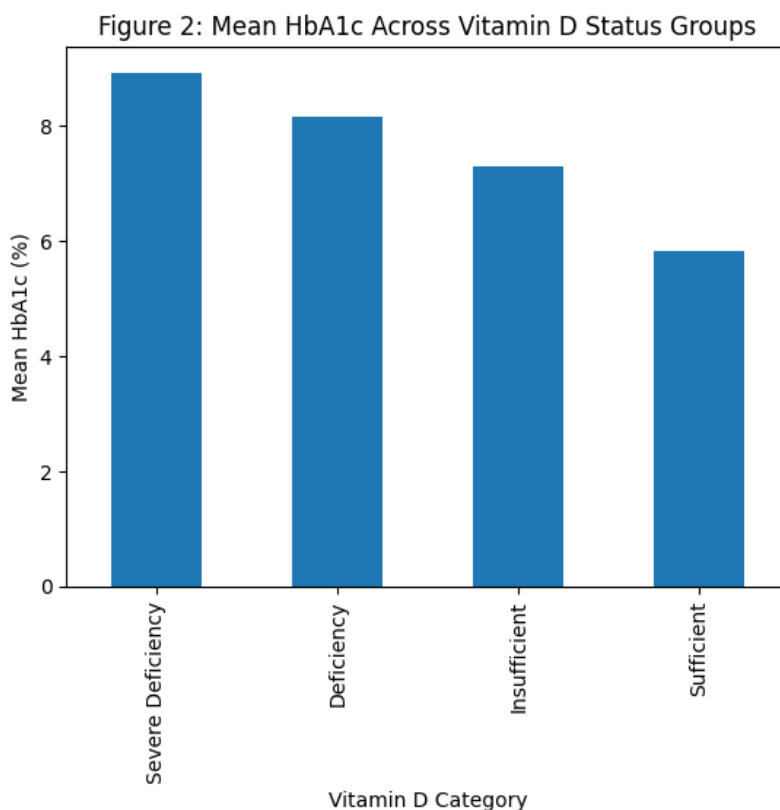


Figure 2: Mean HbA1c Across Vitamin D Status Groups

This bar chart shows progressive elevation in HbA1c from sufficient to severely deficient Vitamin D groups.

Discussion

This study demonstrates that Vitamin D deficiency is strongly associated with poor glycemic control in T2DM patients. The inverse correlation found in our population is consistent with findings from multiple regional and international studies^{1,22}.

Vitamin D influences glycemic metabolism through:

- Enhancement of insulin receptor expression improving insulin sensitivity^{6,9}
- Promotion of pancreatic β -cell insulin secretion^{4,5}
- Suppression of inflammatory cytokines contributing to insulin resistance^{8,10}

Studies conducted in China, Saudi Arabia, Bangladesh, Europe, and North America similarly identified significant inverse Vitamin D-HbA1c associations¹⁻²². Several interventional trials support

improvement in glycemic control following Vitamin D supplementation¹¹⁻¹⁹.

Conclusion

A significant **negative correlation** exists between serum Vitamin D and HbA1c in T2DM patients attending Federal Government Polyclinic Hospital, Islamabad. Vitamin D deficiency is linked with poor glycemic control.

Recommendations

- Routine screening for Vitamin D in diabetic patients
- Consider supplementation in deficient individuals
- Large multicenter randomized controlled trials recommended

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