



Article

Analysis of Calcium and Vitamin D Levels in Patients with Diabetes Mellitus

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Abstract: The article examines the clinical and laboratory features of serum calcium and vitamin D levels in patients with diabetes mellitus and analyze their association with metabolic disturbances. The study included 30 patients with confirmed diabetes mellitus treated in the endocrinology department. Serum calcium and 25-hydroxyvitamin D [25(OH)D] levels were measured. Clinical and biochemical data were analyzed using comparative statistical methods. A high prevalence of vitamin D deficiency was observed among patients. Alterations in calcium levels were also detected, with variations depending on gender and type of diabetes. Vitamin D deficiency and calcium imbalance may contribute to insulin resistance and impaired glucose metabolism. Monitoring and correction of these parameters are essential for improving patient outcomes.

Keywords: diabetes mellitus, vitamin D, calcium, insulin resistance, metabolism.

1. Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It is one of the most significant global health challenges, with rapidly increasing prevalence worldwide. In recent years, increasing attention has been paid to the role of micronutrients, particularly vitamin D and calcium, in the pathogenesis of diabetes mellitus. Vitamin D is traditionally known for its role in bone metabolism; however, emerging evidence suggests that it also plays a crucial role in glucose homeostasis and insulin function [1-10].

Vitamin D receptors (VDR) are widely expressed in pancreatic β -cells, skeletal muscle, and adipose tissue, indicating its involvement in metabolic regulation. Vitamin D influences insulin secretion through modulation of intracellular calcium levels and enhances insulin sensitivity by regulating gene expression [11-15].

Calcium, in turn, is essential for insulin-mediated intracellular processes. It acts as a second messenger in insulin secretion and is necessary for proper functioning of pancreatic β -cells. Disturbances in calcium homeostasis may impair insulin release and contribute to the development of insulin resistance.

Epidemiological studies have demonstrated a strong association between low vitamin D levels and increased risk of type 2 diabetes mellitus. Furthermore, vitamin D deficiency has been linked to chronic inflammation, which is a key factor in the development of insulin resistance [16-20].

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Given these findings, assessing calcium and vitamin D levels in diabetic patients is of great clinical importance, particularly for optimizing treatment strategies and preventing complications.

Objective. To assess serum calcium and vitamin D levels in patients with diabetes mellitus and determine their relationship with disease characteristics.

2. Materials and Methods

The study was conducted in January 2026 at the endocrinology department of Tashkent State Medical University.

Study Population. A total of 30 patients diagnosed with diabetes mellitus were included in the study [21-25].

Inclusion criteria:

- confirmed diagnosis of diabetes mellitus
- inpatient treatment
- availability of laboratory data

Methods. The following parameters were analyzed:

- serum total calcium
- serum 25(OH) vitamin D
- creatinine and urea levels
- clinical history

Blood samples were collected under standard conditions. Vitamin D levels were measured as 25(OH)D, which is the most reliable marker of vitamin D status.

Statistical Analysis. Descriptive and comparative statistical methods were used. Mean values and variability indicators were calculated. Differences between groups were analyzed depending on gender and type of diabetes.

3. Results

General Characteristics

The study included 30 patients with diabetes mellitus, both male and female. Patients had varying durations and types of diabetes [26-30].

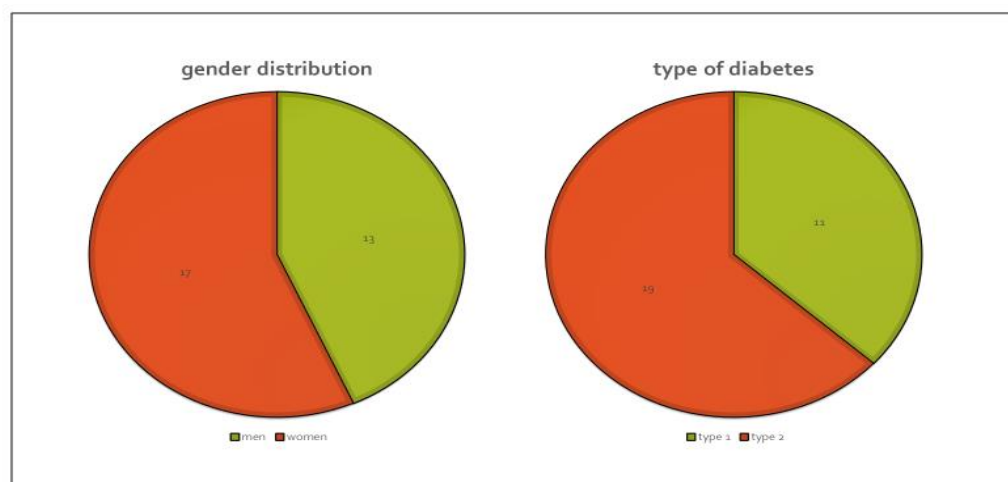


Figure 1. Study Sample: Patients with Diabetes Mellitus

Vitamin D Levels. A significant proportion of patients demonstrated vitamin D deficiency or insufficiency.

Key observations:

- reduced levels of 25(OH)D in most patients

- more pronounced deficiency in patients with type 2 diabetes
- slightly lower levels observed in female patients

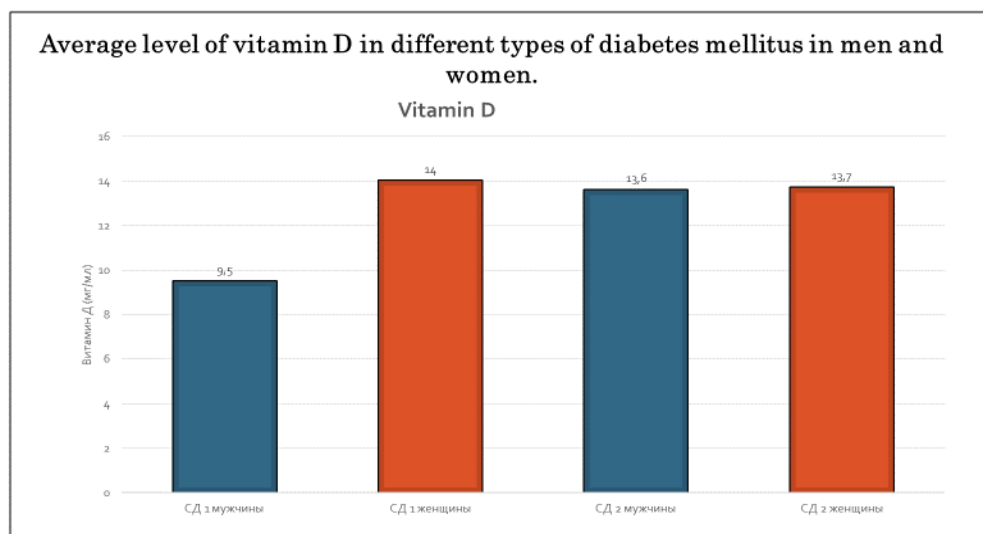


Figure 2. Vitamin D Levels

Calcium Levels

Serum calcium levels showed variability:

- some patients had values at the lower limit of normal
- fluctuations were observed depending on disease severity

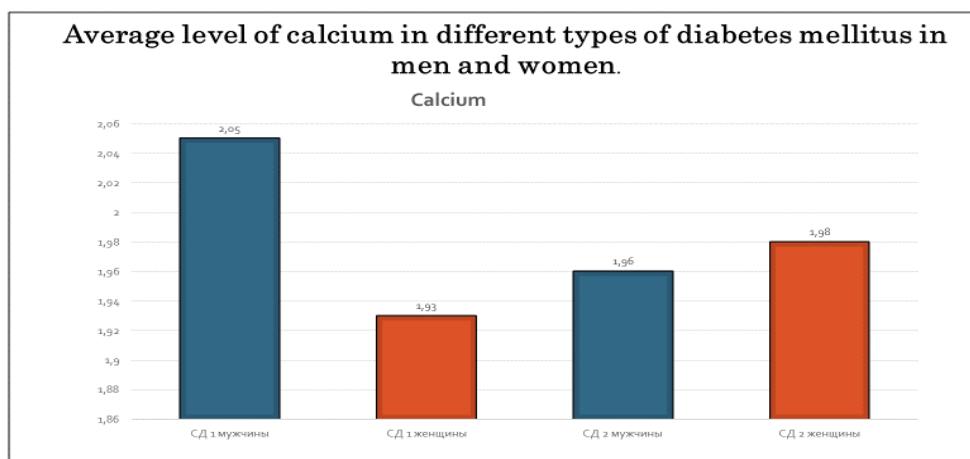


Figure 3. Calcium Levels

Renal Function Indicators. Creatinine and urea levels were evaluated to assess kidney function, as diabetic nephropathy may affect calcium and vitamin D metabolism.

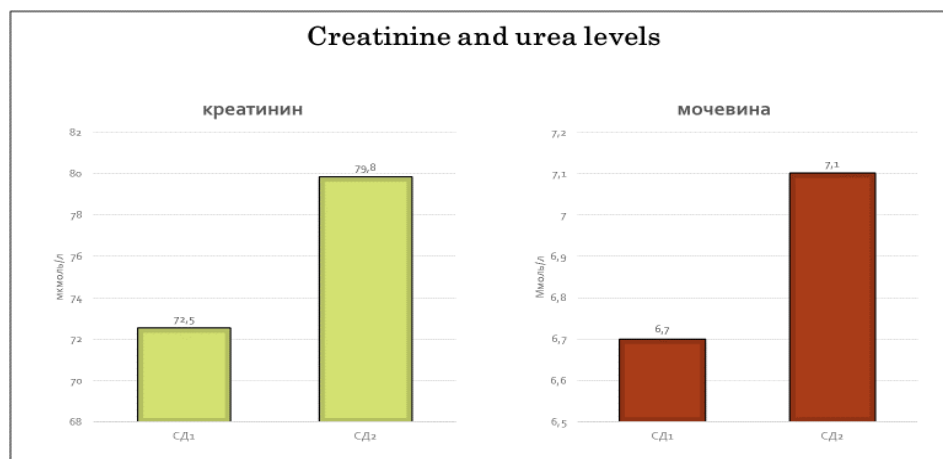


Figure 4. Renal Function Indicators

4. Discussion

The results of this study confirm the growing body of evidence suggesting a significant role of vitamin D and calcium in the pathophysiology of diabetes mellitus [31-36].

Role of Vitamin D in Diabetes. Vitamin D affects glucose metabolism through several mechanisms:

- Insulin Secretion. Vitamin D regulates calcium flux in pancreatic β -cells, which is essential for insulin exocytosis.
- Insulin Sensitivity. Vitamin D enhances insulin receptor expression and improves glucose uptake in peripheral tissues.
- Inflammation reduction. Chronic low-grade inflammation is a hallmark of type 2 diabetes. Vitamin D has immunomodulatory effects that reduce inflammatory cytokines.
- Gene regulation. Vitamin D influences genes involved in glucose metabolism via VDR-mediated transcriptional activity.

Role of Calcium. Calcium plays a key role in intracellular signaling pathways. Adequate calcium levels are necessary for:

- insulin release
- enzyme activation
- maintenance of cellular homeostasis

Hypocalcemia or fluctuations in calcium levels may impair β -cell function and worsen glycemic control.

Clinical Implications. The findings suggest that:

- vitamin D deficiency is highly prevalent in diabetic patients
- calcium imbalance may exacerbate metabolic disturbances
- combined assessment of these parameters should be included in routine evaluation

Correction of vitamin D deficiency may improve insulin sensitivity and glycemic control, although further large-scale studies are needed [37-44].

5. Conclusion

The study demonstrates that patients with diabetes mellitus frequently exhibit vitamin D deficiency and alterations in calcium levels. These disturbances may contribute to impaired insulin function and metabolic imbalance.

1. Vitamin D deficiency is common among patients with diabetes mellitus.
2. Calcium levels vary and may influence disease progression.

3. Vitamin D and calcium play important roles in insulin secretion and sensitivity.
4. Monitoring these parameters is essential for comprehensive diabetes management.

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