

Vitamin D deficiency in obese patients with Type 2 diabetes

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ABSTRACT

Introduction: Vitamin D deficiency is involved in the pathogenesis of insulin resistance, which is the main factor in the development of type 2 diabetes. In Poland, a high percentage of people with vitamin D deficiency is observed, as well as incidences of type 2 diabetes. In 2013, recommendations regarding vitamin D supplementation for Central Europe inhabitants were published, which recommend the use of vitamin D preparations for obese people with a dose of 600-4000 IU / per Day.

Purpose of the work: Evaluation of the prevalence of vitamin D deficiency in obese patients with chronically decompensated type 2 diabetes mellitus and appropriate supplementation in accordance with given recommendations.

Material and method: Evaluation of laboratory tests and applied pharmacotherapy in 40 patients with chronically decompensated type 2 diabetes, aged from 38 to 89 years old.

Results: In the experimental group the average concentration of 25 (OH) D₃ was 20.3 ng / ml ± 11.7. Supplementation of vitamin D preparations was used by 15% of patients. Only 22.5% of patients had correct concentrations of 25 (OH) D₃, but only one person used vitamin D supplements in this group.

Conclusions: One in five obese patients with type 2 diabetes have normal levels of vitamin D. Among obese diabetics nearly 90% of patients do not apply the recommendations for

vitamin D supplementation. Knowledge about the benefits of vitamin D supplementation should be widely propagated among diabetologists and general practitioners.

Keywords: vitamin D, type 2 diabetes mellitus, insulin resistance, carbohydrate management

Introduction

In recent years, the role of vitamin D has increased in clinical significance as one of the factors that may elevate the risk of many diseases and pathological conditions. It is now believed that vitamin D, through its pleiotropic effects in the human body, may play a key role not only in calcium-phosphate management, but also in the development of cardiovascular, neoplastic and autoimmune diseases [1-5]. It has been proven that vitamin D deficiency is involved in the pathogenesis of insulin resistance, which is the main factor in the development of type 2 diabetes. Vitamin D has been shown to increase mRNA synthesis for insulin receptors, thereby improving insulin-dependent glucose transport and, consequently, reducing insulin resistance [4, 6]. In Poland, there is a high percentage of people with vitamin D deficiency, but also of obesity and comorbid type 2 diabetes incidences. That is why in 2013 the recommendations for vitamin D supplementation for Central Europe inhabitants were published, which advocate the use of vitamin D for obese people all year round with a dose of 600-4000 IU / day [7].

Purpose of work

The aim of the study is to assess the prevalence of vitamin D deficiency in obese patients with chronically decompensated type 2 diabetes mellitus. Additionally, the implementation of the appropriate supplementation in accordance with given recommendations was evaluated.

Material and methods

The observations were conducted on 40 patients, aged from 38 to 89 years, including 19 men (47.5%) and 21 women (52.5%) hospitalized in the period from May to July 2017 in the Department of Endocrinology in Lublin, who were diagnosed with type 2 diabetes over 6 months ago. Data regarding the patients was obtained on the basis of a retrospective analysis

of medical records, in particular with regard to anamnesis and subject examination as well as laboratory tests.

The state of carbohydrate metabolism was assessed by means of HbA1c concentration, while the supply of vitamin D3 was classified by the concentration of 25 (OH) D3. Pharmacotherapy, including dietary supplements, was also analyzed. The obtained results of the tests were of quantitative variability and are presented using elements of parametric descriptive statistics - mean and standard deviation. Information on qualitative variables was presented in the form of the number and percentage of cases reported.

Results

Detailed characteristics of the studied group are presented in Table 1.

Table 1. Characteristics of patients in the study group.

	Average age	BMI	Waist circumference	WHR
The whole group	61,2± 10,2 y	35,2±5,8 kg/m ²	115,6± 14,5 cm	1,0 0±0,08
Women	64,4± 9,8 y	34,7±3,9 kg/m ²	111,5±9,8 cm	0,98±0,08
Men	57,8 ± 9,9 y	35,9±7,4 kg/m ²	120,2±17,5 cm	1,04±0,06

In all subjects, a chronic lack of compensation of the carbohydrate metabolism (mean HbA1c 9.5% ± 1.9) was demonstrated. As a result of the conducted tests, it was found that the average vitamin D concentration was 20.3 ng / ml ± 11.7, however with normal total calcium in all the patients' venous blood (mean 9.31 ± 0.4 mg / dl N: 8, 7-10.4). Inadequate supply of vitamin D occurred in 77.5% of patients. Hypovitaminosis D (30%) was observed the most frequently, and an extreme deficiency of vitamin D occurred in every fourth patient (25%). The percent distribution of supply in vitamin D is shown in Figure 1. No hypervitaminosis was observed in obese patients with type 2 diabetes.

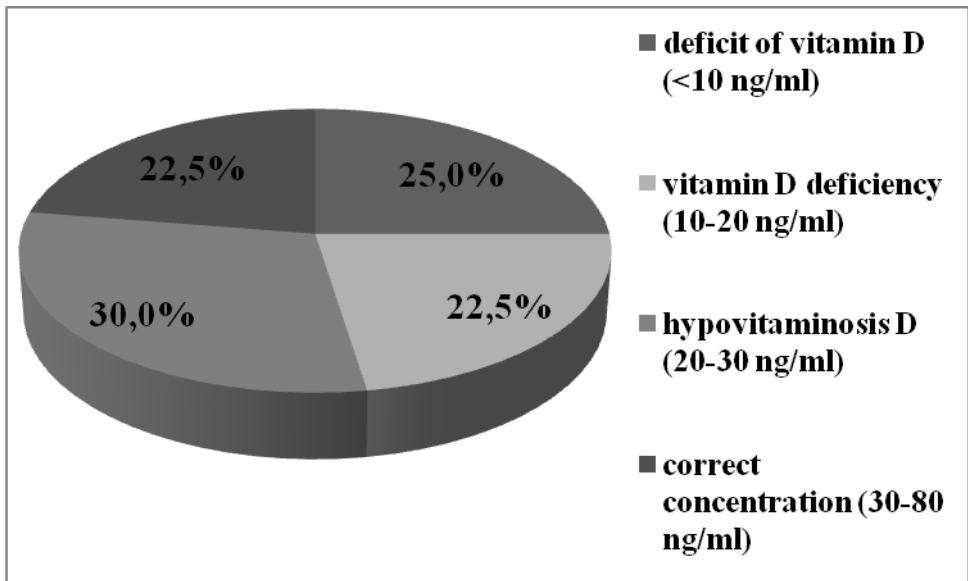


Figure 1. Compensated serum 25 (OH) D3 in the test group.

Supplementation with vitamin D preparations was used by 15% of patients (6), at a dose of 400-3000j / day. Only 9 patients had a normal concentration of 25 (OH) D3 (above 30 ng / m) l, but in this group only one person used supplementation.

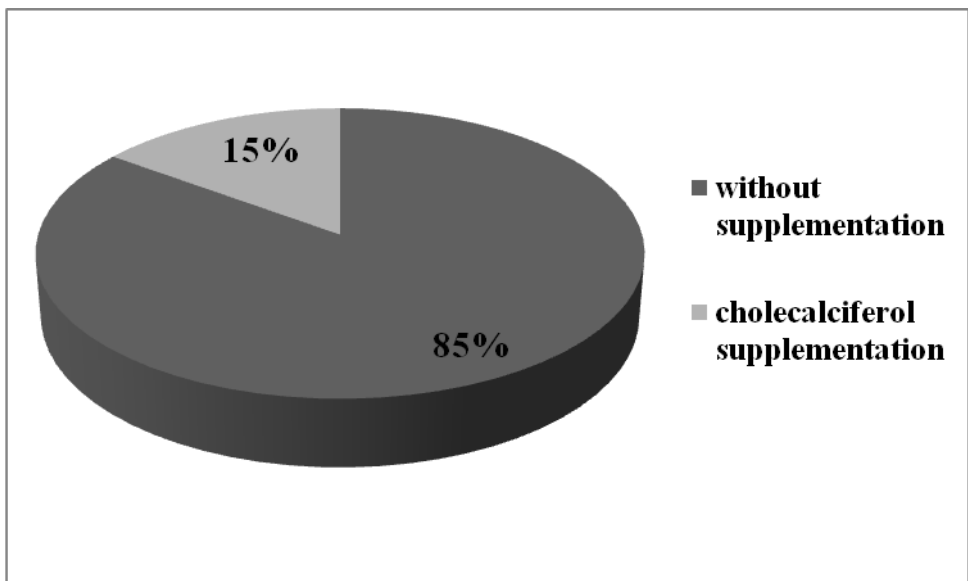


Figure 2. The implementation of supplementation recommendations.

Discussion

In studies carried out in recent years, there is an increase in evidence confirming the important role of vitamin D deficiency in the development of carbohydrate disorders, including type 2

diabetes. Vitamin D receptors (VDR) and specific enzyme 1α - hydroxylase have been shown on pancreatic β cells, which confirms the effect of active metabolites of vitamin D have on carbohydrate metabolism [6, 8]. Calcitriol binding to VDR receptors located on pancreatic β cells stimulates insulin secretion in response to changes in serum glucose. The expression of VDR receptors on pancreatic cells and the presence of VDRE sequences in the insulin gene promoter and its calcitriol-dependent expression indicate the need to maintain normal vitamin D concentrations in order to maintain adequate synthesis of endogenous insulin [9-12]. Additionally, it was found that active metabolites of vitamin D accelerate the conversion of proinsulin to its active form, even in people without known diabetes [9,13]. Co-occurring lack of proper supply of vitamin D also results in the intensification of inflammation, which plays an important role in the pathogenesis of type 2 diabetes and insulin resistance [13, 14]. Vitamin D deficiency also increases the risk of developing insulin resistance and the typical features of metabolic syndrome, such as obesity, hypertension or lipid metabolism disorders, which promotes the development of diabetic complications [15-18].

Low levels of vitamin D should be associated with increased incidences of microvascular and macrovascular complications in patients with diabetes. In particular, patients with nephropathy are at risk of vitamin D deficiency and its level depends on the severity of the disease [18-20]. Based on literature data, it has been shown that compensating vitamin D deficiency after adequate supplementation may lead to a reduction of insulin resistance, which in turn promotes HbA1c normalization and restoration of carbohydrate balance [13, 21-23].

Studies by numerous authors indicate the necessity of screening for vitamin D deficiencies in patients with type 2 diabetes, because diagnosing vitamin D deficiencies and implementing supplementation therapy in this group of patients may significantly affect metabolic control and improve disease control.

Conclusions

In the spring and summer season, despite the relatively good sun exposure in Poland, only every fifth obese patient with type 2 diabetes has the correct concentration of vitamin D. Among obese diabetics, the supplementation of vitamin D is not used in almost 90% of patients. Knowledge about the benefits of supplementing Vitamin D should be widely promoted among diabetologists as well as family medicine doctors.

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