Serum 25(OH) D in Diabetes Mellitus Type 2: Relation to Glycaemic Control

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Abstract

Introduction: There is increasing evidence on association between vitamin D insufficiency and diabetes, but the impact of vitamin D status on glycaemic status and vice versa, has not been well reported. Our aim was to investigate the level of 25-hydroxyvitamin D(25(OH)D) and the prevalence of vitamin D abnormalities in patients with diabetes mellitus (DM) type2 and in those without diabetes; and to ascertain the impact of 25(OH)D levels on glycaemic control and vice versa.

Material and Methods: Serum 25(OH) D was determined in 337 Kurd patients with DM type2 and in 146 patients without DM type2. Its correlation with the marker of glycaemic control (HbA1c) as well as with anthropometric parameters (age, gender, and body mass index), diabetes duration, and serum blood glucose was examined.

Discussion: The mean ± SD values for serum 25hydroxy (OH) D levels of diabetic patients was 25.6±12.6 ng/ml and those for the controls was 34.1±14.7 ng/ml (p<0.01). The prevalence of vitamin D insufficiency was significantly higher among diabetic patients than among the controls (53.7% vs. 29.4%, p<0.001).

Results: Some have reported an improvement of glycaemic control results. Some have reported an improvement of glycaemic control [6]; others have reported no effect [7], while others have shown that a low vitamin D status is present in two thirds of patients with type 2 diabetes, and to ascertain the impact of low vitamin D levels on glycaemic control and vice versa.

Conclusion: A low vitamin D status is present in two thirds of patients with DM type 2, particularly among diabetics with poor glycaemic control and among those with longer diabetes durations. This may reflect the additive effect of glycaemic control on vitamin D status.

Keywords: Vitamin D, DM type2, Glycaemic control

Introduction

Vitamin D has sparked widespread interest in the pathogenesis and prevention of diabetes. Vitamin D has been shown to stimulate insulin production [1]. Association between low vitamin D levels and decreased insulin sensitivity has been reported [2]. Low vitamin D concentrations are associated with a higher likelihood of the occurrence of diabetic complications, such as cardiovascular disease [3], renal impairment [4] and peripheral arterial disease [5]. In addition, diabetic patients are a high risk category for developing vitamin D deficiency, which may potentially lead to diabetic complications.

STUDIES done on the administration of vitamin D supplements in vitamin D-sufficient patients with DM type 2 have yielded conflicting results. Some have reported an improvement of glycaemic control [6]; others have reported no effect [7], while others have shown that the restoration of vitamin D reserves in vitamin D-deficient patients improved glucose tolerance [8].

This study aimed to investigate vitamin D status among patients with type 2 diabetes, and to ascertain the relationship between low 25(OH) D levels and the marker of glycaemic control, HbA1c.

Material and Methods

A cross-sectional study was carried out during the period from May 2012 to February 2013. Four hundred and eighty three Kurds were included (337 with and 146 without type 2 DM). All these individuals were selected from among adult patients attending the Diabetic Center of Azadi Teaching Hospital, Duhok, Kurdistan Region, Iraq, during the period of the study. Selection of cases and healthy controls was carried out by using a systematic random sampling technique. Patients with acute illnesses, a history of chronic liver or renal disease, and those who were taking medication that altered vitamin D metabolism and status were excluded from the study. None of the females was pregnant. All individuals completed a pre-tested questionnaire which included anthropometric data and a diabetic record. Body mass index was calculated for each subject. Biochemical blood measurements were determined by a standard laboratory procedure using Cobas 6000, Roche/Hitachi. Serum concentration of 25(OH) D was measured by enzyme linked immunosorbent assay (ELISA) method.

The vitamin D status was assessed according to the following criteria: Severe deficiency- <10 ng/ml; Insufficiency- 10-25 ng/ml and sufficiency ->25-150 ng/ml. A cutoff point of <25 ng/ml of 25(OH) D was used to classify patients as on low vitamin D status. All data were analyzed using the Statistical Package for Social Sciences (SPSS), version 21.0. Independent t-test was used to assess differences in serum analytes among groups. The statistical significance, direction and strength of linear correlation between 2 quantitative variables were measured by using Pearson’s correlation coefficient test. Categorical variables were compared by Chi-square test.

Results

The general characteristics of the individuals have been described in [Table/Fig-1]. Of the 337 patients, 58% had low vitamin D levels (25(OH) D<25ng/ml) as compared to 44/146 of the controls (30.1%).
The mean ± SD of serum 25(OH) D levels with respect to some variables, has been shown in [Table/Fig-2]. The mean serum 25(OH) D level was significantly lower (p<0.01) for patients with poor glycaemic control as compared to that for fair and good glycaemic control diabetics, respectively. A significant difference was also noticed between mean ± SD values for serum 25(OH) D level of patients with a diabetes duration of more than 5 years and of those with a duration less than 5 years (p<0.05). No statistically significant difference was found in the mean values of serum 25(OH)D, using a p-value of 0.05 for age, sex and body mass index of diabetic patients.

The distribution of patients with low and sufficient vitamin D levels has been shown in [Table/Fig-3]. Among the different age groups, gender and different BMI groups, the prevalence of low vitamin D levels was not significant as compared to that of sufficient levels. Patients with poor glycaemic control had a higher prevalence of low vitamin D status (90%) than those with sufficient vitamin D (76%). Similarly, patients with disease duration of more than 5 years had a higher prevalence of low vitamin D status as compared to vitamin D sufficient group (51% vs. 40%).

On using the Pearson’s correlation coefficient (r), the results showed a significant inverse relationship between serum 25(OH) D concentrations and HbA1c (r=-0.238, p<0.01) [Table/Fig 4]. The correlations between serum 25(OH) D concentrations and age, BMI, and duration of disease were not statistically significant (r=-0.04, r=-0.03, and r=-0.153), respectively.

**DISCUSSION**

In several cross-sectional studies, patients with Type 2 DM or glucose intolerance were found to have lower serum vitamin D concentrations as compared to individuals without diabetes [9, 10]. In this study, we found that among two thirds of the patients and that about one third of the controls had low vitamin D status (25(OH)D concentration <25 ng/ml). Such a high prevalence of low vitamin D status is worth mentioning. It is favourably comparable to values from the developing countries [11], but it is markedly higher than values of diabetic and normal populations in western countries [12,13]. The discrepancy of our results as compared to those of other studies may be related partly to the nutritional status. However, several factors are known to make a negative impact on vitamin D status, particularly in diabetic patients. Of these, glycaemic control and diabetes duration are the factors which cause the most marked negative effects on serum 25(OH) D concentrations. There was a trend towards an inverse 25(OH) D-HbA1c association. Patients with poor glycaemic control (as was assessed by HbA1c%) had lower mean serum 25(OH) D concentrations and a higher prevalence of low vitamin D status.
This study indicated that low vitamin D status was present in two thirds of patients with type 2 diabetes, particularly among patients with poor glycaemic control and in those with longer diabetes durations. Therefore, we recommend the routine screening of vitamin D status in patients with DM type 2. Vitamin D supplementation may be an effective public health intervention means, to improve the vitamin D status of the population.

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REFERENCES