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Assessment of Serum Vitamin D3 Level in Patients with Type 2 Diabetes Mellitus

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Abstract

Background: *The aim of this article is to determine the association between serum vitamin D level and newly diagnosed type 2 diabetes mellitus in Erbil city.*

Methods: *This is a case-controle study involving 100 subjects which included 2 groups, 50 type 2 diabetic patients diagnosed recently, 50 healthy individuals as control group. The study is conducted from Aprilto December -2015 in Layla Qasim diabetic center. The data collected from all cases including history and examination all recorded on specially designed questionnaire. From all cases blood sample sent for serum vitamin D3 level.*

Results: *From the total of 100 subjects, the mean age ofcases was48.8 years and of controls 48.1 The male: female ratio was 1:1 in both cases and controls. The mean serum vitamin D3 level of cases was (9.88 ±6.12) ng/ml and it was significantly lower than the control (14.34±6.4)ng/ml, (p-value=0.001) although both groups lied within the deficient range. Within the cases the vitamin D3 were deficient in 47(94%) of cases in compared to 44(88%) of control group , The serum vitamin D3 level was insufficient in 2(4%) cases in comparing to 4(8%) of control and sufficient in 1(2%) case in comparing to 2(4%) of control.*

Conclusion: *The mean serum level of vitamin D3 in newly diagnosed type 2 diabetic patients was significantly lower than that of control group, vitamin D deficiency could contribute to etiology of type 2 diabetes mellitus.*

Keywords: *type 2 diabetes mellitus, serum vitamin D3 level.*

Introduction

The prevalence of type 2 Diabetes Mellitus (T2D) is rising at an alarming rate both locally and globally, it reaches 9.3 % in Iraq at 2011 it may increase to 10.2% at 2030[1]. Epidemiologic information recommends that 9 out of 10 cases of T2D could be related to forms of adjustable behavior [2]. Essentially adjustable environmental risk factors for T2D have been recognized, the main one being obesity also recognition of other environmental and simply adjusted risk factors is immediately needed [3].

The key and greatest well identified function of vitamin D is to keep calcium and phosphorus homeostasis and support bone mineralization. However, current information recommends that vitamin D may also be essential for a range of non-skeletal functions including neuromuscular function and falls, psoriasis, and prostate cancer [4,5]. Vitamin D insufficiency has been supposed as a risk factor for type 1 diabetes[6] Deficiency of vitamin Dhas been linked with damaged β-cell function and insulin resistance in humans [7, 8].

Vitamin D (calciferol) is a generic name for a set of fat steroids of which the two are vitamin D2 (ergocalciferol) and vitamin D3 (colecalciferol). Vitamin D is gained from skin radiation mainly and partial dietary sources. Vitamin D from the skin and diet is processed in the liver to 25(OH) D, which has a long half life and is the main circulating metabolite and indicator of vitamin D status [9] . In the kidney, 25-hydroxyvitamin D is metabolized by the enzyme 25-hydroxyvitamin D-1(alpha)-hydroxylase to its energetic form, 1,25 (OH)D2. The mechanism of action of the active form of vitamin D is initiated by its binding to vitamin D receptor (VDR). VDRs are detected in most body tissues, and the enzyme responsible for altering 25 (OH)D to 1,25(OH)2 is also detected in a range of extra renal sites, such as endothelial cells, beta cell and immune cells[10]. Human studies have revealed that - vitamin D supplementation in infancy decreases the hazard of type1 diabetes mellitus during early adulthood [11]. As vitamin D modulate insulin receptor gene function and insulin secretion it is an exciting environmental factor for type 2 diabetes mellitus[12].The aim of this study is to determine the role of serum vitamin D level in the aetiology of newly diagnosed type 2 diabetes mellitus in Erbil city.

Patients and Method

Study Design

This is a case-control study involving 100 subjects which included 2 groups, 50 type 2 diabetic patients diagnosed recently The patients recruited were attending for management, The second group included 50 age and sex matched apparently healthy individuals as control group.

Study Setting: This study is conducted from April-2015 to December -2015 in Layla Qasim diabetes center in Erbil city.

Inclusion criteria: All recently diagnosed type 2 DM patient age >40 year.

Exclusion criteria: Those recently treated with vitamin D supplement, those on drug that interfere with vitamin D metabolism, those having chronic kidney and liver disease, those having parathyroid diseases ,those having metabolic bone diseases, those having cancer with bone metastasis, those with advance liver disease, Pregnant lady and female on oral contraception pill all have been excluded from the study.

Data Collection

The data were collected from all cases including history (age , sex, occupation , drug history) and physical examination including (blood pressure, weight, height) all were recorded on specially designed questionnaire. From all cases blood sample were checked for serum vitamin D3 level, the blood samples were taken through venipuncture, 1ml of blood put in special red-top tube then samples sent for centrifugation and the serum were preserved at room temperature until convenient time all testes were done within less than 5 hours, then the level of vitamin D were divided into sufficient >30 ng/ml, insufficient 20-30 ng/ml and deficient if < 20 ng/ml[13], all samples were analysed in the same lab. Using Cobas e 411 machine.

Ethical Consideration

All the patients and subjects were informed about the aim and objective of the study, This study is approved by Research Ethic Committee of college of medicine-Hawler medical university.

Data Analysis

The data analysis was performed with Statistical package of social sciences (SPSS) (version19.0). Chi-square test was used for comparison between two groups, P values < 0.05 was considered statistically significant.

Result

From the total of 100 subjects which were equally distributed in to 50 cases (patients) and 50 control (Apparently healthy individuals), Their ages ranges between 40-75 years old with the mean age within the cases were 48.8 years and 48.1 years within the control group Sex distribution within the cases were 25 (50%) female out of 50 and the remaining 25 (50%) were male, in the control side 25(50%) were female out of 50 and the remaining 25(50%) were male. The mean vitamin D3 of case group (9.88 ±6.12) ng/ml was significantly lower than control (14.34±6.4) ng/ml, (p-value=0.001) but both groups lies within deficient range (Figure 1)

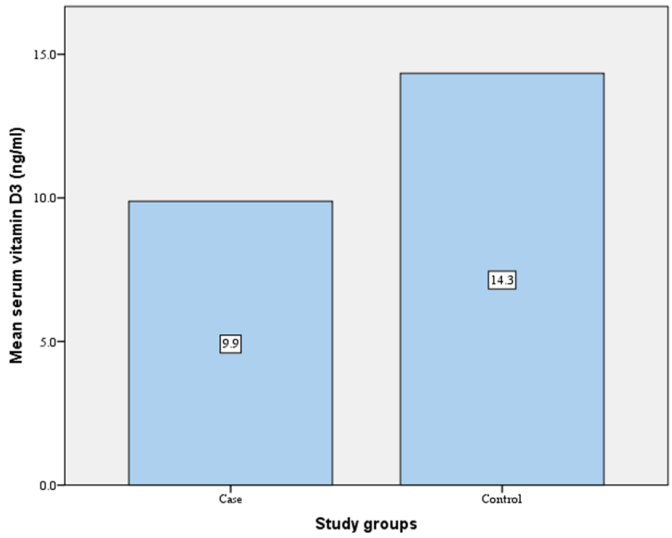

Figure 1: Mean serum vitamin D3 levels of cases and controls.

Within the cases group the serum vitamin D3 were deficient in 47(94%) cases in comparing of 44(88%) of control, insufficient in 2(4%) cases in comparing to 4(8%) of control and sufficient in 1(2%) case in comparing to 2(4%) of control with no statistically significant differences between the case and control regarding then number of cases and control subjects with vitamin D3 deficiency (p-value=0.57) (figure 2)

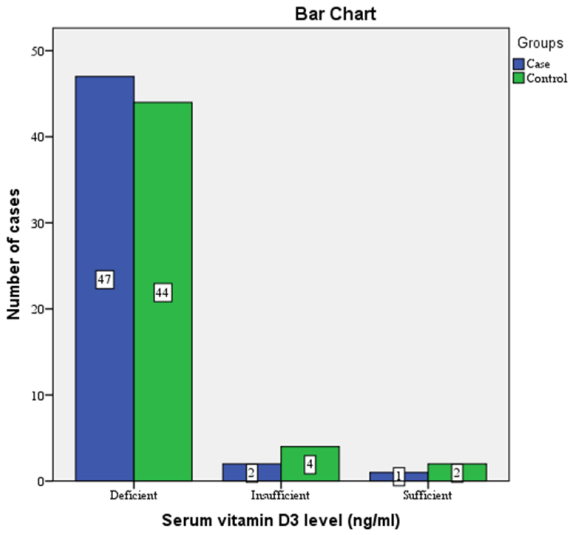

Figure 2: Distribution of serum vitamin D3 level among cases and controls.

Among 50 cases of newly diagnosed T2D 34 (68%) cases were obese and the remaining 16(32%) cases were either normal or over weight in comparing with 50 healthy subjects 22 (44%) of them were obese and remaining 28 (54%)were overweight and normal BMI, overall among obese cases (both cases and control subjects) 56(56%) cases, 51(51%) of them having deficient vitamin D3 and remaining 5 (5%) cases were either vitamin D3 insufficient 3(3%) or sufficient 2(2%) cases while among 44(44%) non obese cases(case and control subjects) 40 (40%) cases were vitamin D3 deficient and remaining 4 (4%) cases were either vitamin D3 insufficient 3(3%) cases or sufficient 1 (1%) case (p-valu=0.02) which is significant (figure 3)

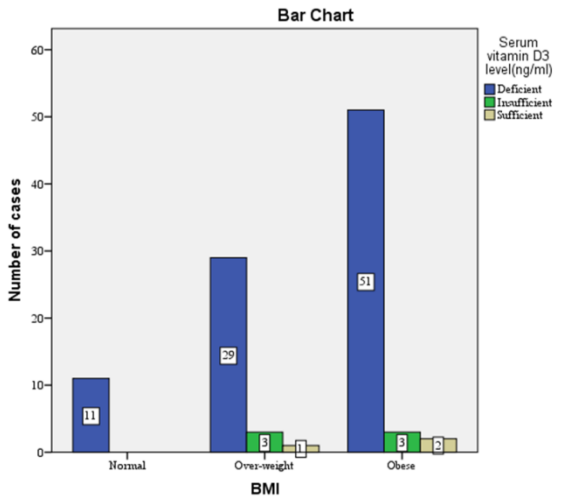

Figure 3: Distribution of serum vitamin D3 level according to BMI among both cases and controls.

The mean serum vitamin D have been compared between obese participant their number 56 cases(of both cases and controls group) and non obese participant their number 44 cases (of both cases and controls group) there was no significant difference between mean serum vitamin D3 level of obese and non obese subjects mean serum vitamin D3 was 11.9 ng/dl in obese subjects (of both cases and controls group) in comparing to 12.4 ng/dl of non obese subjects(of both cases and controls group) p-value:0.67.

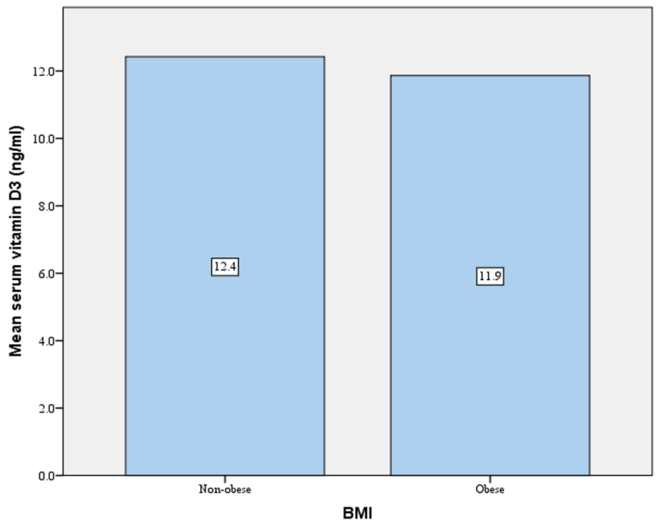

Figure 4: Mean serum vitamin D level of nonobese participant (cases and controls) and obese participant (cases and controls)

Discussion

Type 2 DM is a global health problem the prevalence increasing worldwide, it needs special health care awareness and it is important to search for all reversible and preventable risk factors and associated etiological factors. Vitamin D deficiency is currently considered as pandemic in all age groups in humans [14,15]. High prevalence of vitamin D deficiency has been observed in normal fit persons at different ages.

The high rate of Vitamin D deficiency in this study was clarified by diminished sun light exposure ,restricted outdoor actions, and reduced alertness about food support with vitamin D, Only a small quantity (30%) of vitamin D can be gained from the nutrition, since little diets contain it naturally[16]. As a consequence, largely vitamin D requirements are comes from the sunlight-madephoto chemical conversion of 7-dehydrocholesterol [17,16,18].

Several studies have concentrated on the prevalence of vitamin D deficiency in patients with type 1 DM. Prevalence change from 90.6% with a vitamin D cutoff value of < 30 ng/mL from the Bener A, et al. studyin Qatar [19]to 15% with a vitamin D cutoff value of < 20 ng/mL from Svoren BM, et al. study at Joslin's diabetes center [20] and prevalence of 54% with a vitamin D cutoff value of < 32 ng/mL from Littorin B, et al. Sweden study[21]. To date, a important reverse association has been found between serum 25(OH)D and type 2 DM or impaired glucose metabolism in both cross-sectional studies[22,23] and longitudinal studies [24, 25, 26, 27] .

In this study 25(OH)D was significantly lower (mean ±SD of (9.88 ±6.12ng/mL) in patients, compared with (14.34±6.4) ng/mL of controls. Several newly available studies have revealed significantly lower levels of 25(OH)D in patients with diabetes compared with controls [19,21,28,29] . In the present study, lower level of vitamin D in people with diabetes compared to control subjects could explain the relation between the two disorders in our community.

Type 2 DM is a disease originate from defects of insulin sensitivity and secretion. The condition is more commonly seen in obese inactive persons and greater levels of inflammatory cytokines [30]. Several studies have recommended that vitamin D could have a role in refining beta-cell function and improving insulin sensitivity. The National Health and Nutrition Examination Survey (NHANES) revealed an inverse relationship between 25(OH)D and the incidence of T2DM[31]. A similar inverse association between 25(OH)D and glycemic status was mentioned in other studies [32,33].

The strength of our study is that we assessed serum vitamin D level in recently diagnosed type 2 DM not those have been diagnosed for long time so we excluded the effect of food restriction on serum vitamin D level and although the diabetes cases have more obese patient with significant differences between the cases and control subjects as expected for diabetic patient to have more obese cases , but the mean serum vitamin D3 in this study was not significantly differ between obese and non obese cases so this exclude the effect of obesity on serum vitamin D level on the result of the study as a confounding factor , as had been shown by several studies that serum vitamin D is lower in obese individual than non obese because obesity is correlated with low vitamin D and highT2DM risk [34, 35,36].

Conclusion: The mean serum level of vitamin D3 in newly diagnosed type 2 diabetic patients was significantly lower than that of control group, vitamin D deficiency could contribute to etiology of type 2 diabetes mellitus.

The limitations of our study

we differentiated patients with type 2 DM from type 1 on the basis of age and clinical presentation. Although LADA could present after 40 years of age. We did not estimated their beta-cell reserve, nor did we measured their islet cell antibodies, but we assume that lack of these tests did not affect the outcomes, as we had the wider aim of finding vitamin D status in adult patient with diabetes.

Recommendations

1. Screening of all newly diagnosed type 2 DM for vitamin D deficiency
2. Further studies regarding serum vitamin D3 in pre-diabetes individual
3. Evaluation of serum vitamin D3 in patients with type 2 diabetes of different duration of the disease

Conflicts of interest:

The author reports no conflicts of interest.

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