The Role of Vitamin D3 in Improving Lipid Profile in Type 2 Diabetes Patients with Cardio Vascular Disease

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Abstract

Hyperglycemia is the major risk factor for microvascular complications in patients with type 2 diabetes (T2D). Vitamin D a fat-soluble prohormone, has wide-ranging roles in the regulation of many physiological processes through their interactions with. This aim of this study to investigate the role of Vitamin D3 and other biochemical to associated with the risk of type 2 diabetes with CVD. This study was carried out at the National Diabetes Center (NDC) / Mustansiriyah University during the period from 1/11/2020 to 1/2/2021. group of type2 diabetes with CVD patients, including 80 patients from both sexes (male and female), and apparently healthy control group (n=40) were enrolled. The highest significantly were in values of FBS , HbA1c, TC , TG , LDL) were (195.33 - 89.45 mg/dl, P= 0.001; 8.75 - 4.86 %, P= 0.001; 234.08 158.9 mg/dl, P= 0.001, 221.25 versus 83.37 mg/dl, P= 0.001 and 132.62 - 87.40 mg/dl, P= 0.001 respectively). Vitamin D3 levels were significantly lower for patients group than that in control healthy people were. The conclusion of this study found Vitamin D3 Deficiency showed effective on lipid profile in Type2 diabetes patients with CVD .

Key word: *T2DM, CVD, vitamin D3, Lipid profile, National Diabetes Center.*

Introduction

Vitamin D deficiency and diabetes mellitus are two common conditions in the elderly population. Vitamin D deficiency is currently a topic of intense interest, and is widely prevalent across all ages, races, geographical regions, and socioeconomic strata. Suboptimal vitamin D status contributes to many conditions, including type 2 diabetes mellitus(TDM) [(1)]. Despite several advances in pharmacotherapy for type 2 diabetes, the increasing burden of the disease highlights the need for innovative and cost-effective prevention approaches. It is estimated that approximately one-third of adults in the United States are at increased risk of developing diabetes based on their having prediabetes, which is defined by the American Diabetes Association as impaired fasting glucose, impaired glucose tolerance, or abnormal hemoglobin A1c (HbA1c) [(2)]. Vitamin D, a sec-steroid, plays a pivotal role in the protection against numerous diseases, including cardiovascular diseases(CVD).

Vitamin D deficiency is associated with not only CVD itself but also cardiovascular risk factors [(3,4).] Low vitamin D levels could result in dyslipidemia, and lipid abnormalities that is, an increase in triglyceride (TG), total cholesterol (TC), and low density lipoprotein cholesterol (LDL-C) levels and a decrease in high-density lipoprotein cholesterol (HDL-C) level have been identified as important

risk factors for atherosclerosis and cardiovascular disease in adulthood [5,6]. vitamin D supplementation has become worldwide clinical practice. In line with this practice, the recently updated Kidney Disease Improving Global Outcomes guidelines on CKD-MBD suggests that vitamin D deficiency and insufficiency be corrected using treatment strategies recommended for the general population [7,8]. The aim of this study to investigate the role of Vitamin D3 and other biochemical to associated with the risk of type 2 diabetes with CVD.

Materials and Methods

Subjects and blood sample collection:

This study was carried out at the National Diabetes Center /Mustansiriyah University during the period from 1/11/2020 to 1/2/2021. This study was conducted on type2 diabetes with cardiovascular diseases group, including 80 patients with type2 diabetes with cardiovascular diseases of both sexes (male and female) , aged (40-65). Apparently the health control group consists of 40 healthy people. They were chosen on the basis of the diagnoses done by specialist . Each patient has a record of his disease and the analyzes he conducted at the National Diabetes Center. Samples were collected from the patients of type2 diabetes with cardiovascular diseases group was in a fasting state, as were samples from healthy people in a fasting state. 10 ml of venous blood samples were collected. includes the serum is obtained by placing the blood in a sterile tube gel and allowing it to clot at 37 ° C for 30 minutes before centrifugation . The tubes are centrifuged at 6000 revolutions per minute for a period of 5 minutes, then we collected the serum and distributed to several parts to make Lipid profile tests (TC , TG, HDL, LDL and VLDL) , Kidney function Parameters(Urea and Creatinine), vitamin D3 levels ,Insulin level , Homa-IR and fasting blood sugar test.

Biochemical analysis:

Biochemical analysis for Lipid profile tests (TC , TG, HDL, LDL and VLDL , Urea , Creatinine and FBS was performed by using Automatic biochemistry analyzer by the kenza tx240/biolab / French. The quantitative determination of vitamin d3 In vitro assay in serum. by the miniVIDAS auto analyzer, (bio Mérieux Company) France and Insulin levels measured by the enzyme- linked immunosorbent assay (ELISA) DRG kit.

Statistically Analysis

The data analysed using Statistical Package for Social Sciences (SPSS) version 25. The data presented as mean , standard deviation and ranges. A level of P value less than 0.05 was considered significant.

Result and discussion

The distribution of study groups by age, gender and BMI is shown in figures (1 ,2 and3). Study patients' age was ranging from 40 to 65 years with a mean of 54.36 years and a standard deviation (SD) of ± 6.39 years, while study patients' gender were (52.26% , 47.74%) male and female respectively, we founded that there 51% of patients 'group with 18-24.9 kg/m2 BMI . In comparison between study groups by age and gender, we noticed that there were no significant differences ($P \geq 0.05$) in age, and gender between study groups as shown in tables (1) and (2).

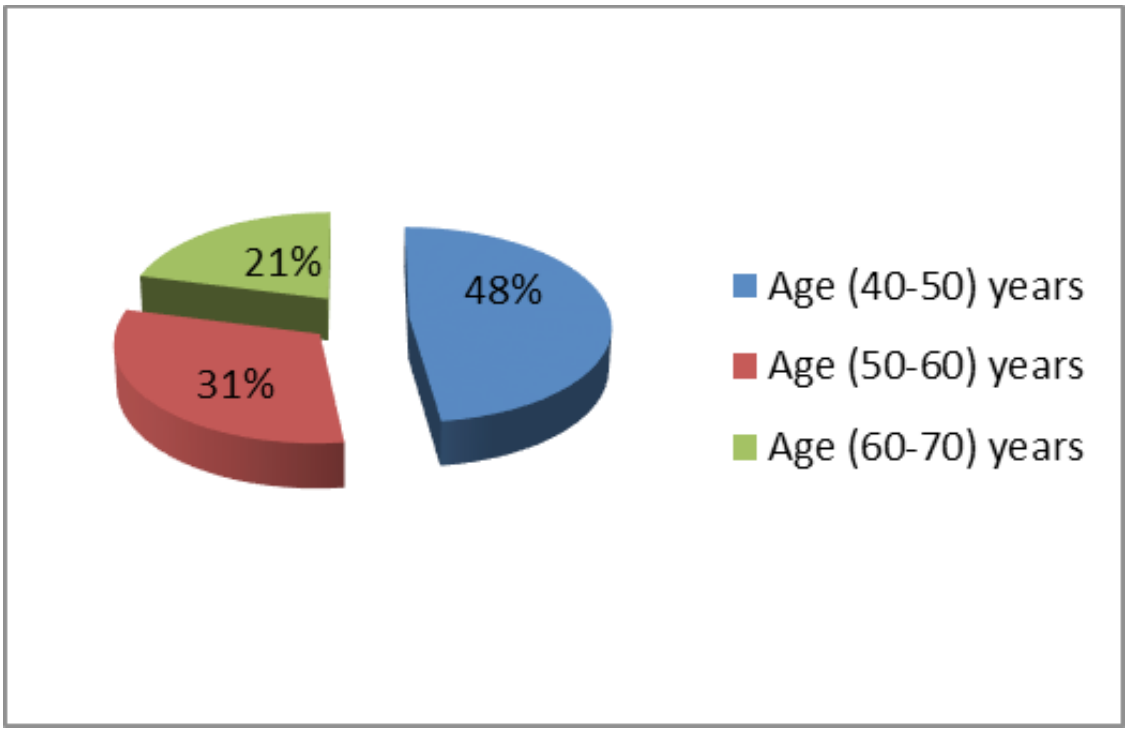

Figure 1: Distribution of vitamin D3 according to age in T2DM with CVD.

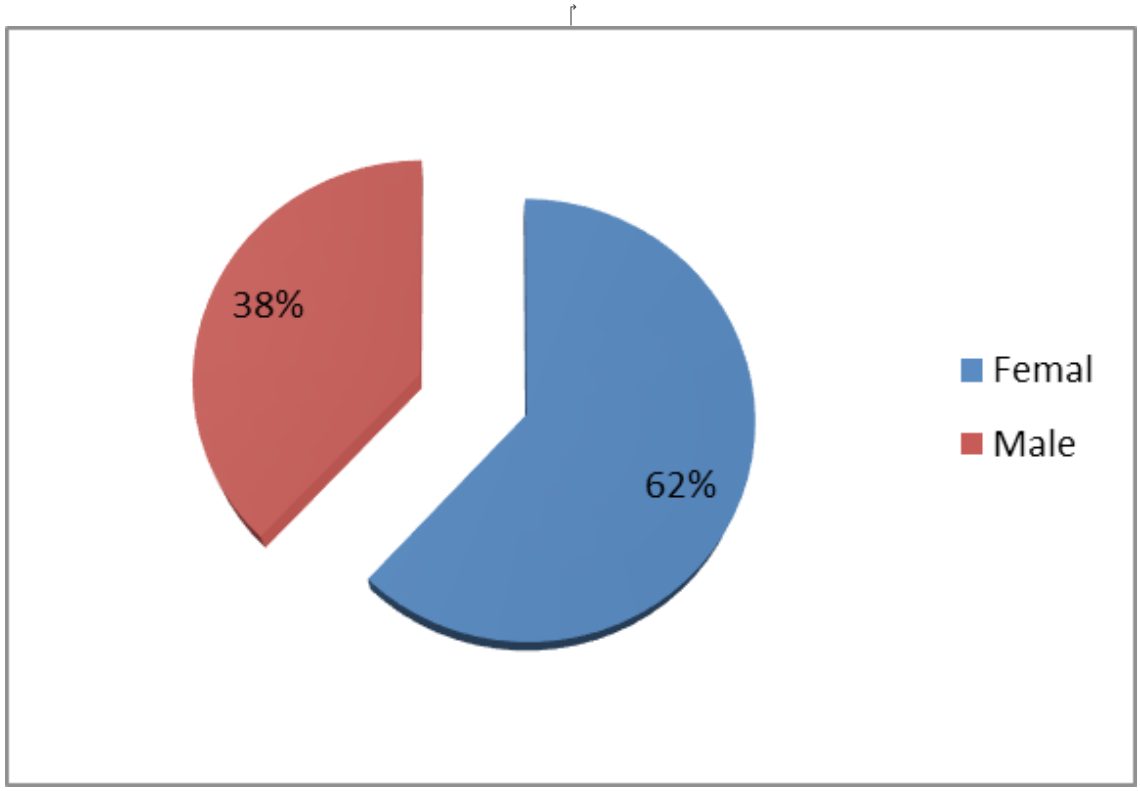

Figure 2: Distribution of vitamin D3 according to gender in T2DM with CVD.

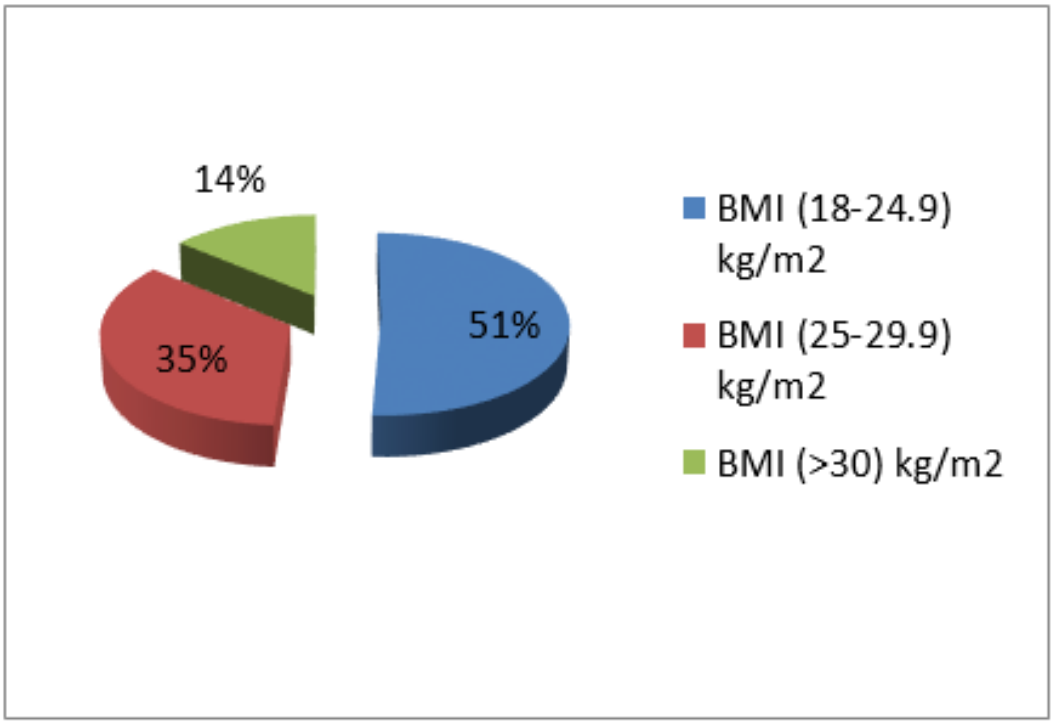

Figure 3: Distribution of vitamin D3 according to BMI in T2DM with CVD

The comparison between study groups by age and gender, we noticed that there were no significant differences ($P \geq 0.05$) in age, and gender between study groups as shown in tables (1) and (2).

Table 1: Comparison between study groups by age.

	Study Group		P – Value
Age (Years)	Patients Mean ± SD	Control Mean ± SD	
	54.36 ± 6.39	38.12 ± 5.6	0.06

Table 2: Comparison between study groups by gender.

Gender	Study Group		Total (%) n= 120	P - Value
	Patients n= 80	Control n= 40		
Male	41 (51.25)	22 (55)	63 (52.5)	0.162
Female	39 (50.0)	18 (60.0)	57 (47.5)	

Type 2 diabetes mellitus is a major risk factor for cardiovascular disease. However, compiled data suggest that type 2 diabetes affects the risk of cardiovascular disease differentially according to sex, large meta-analyses have confirmed that women with type 2 diabetes have a higher relative risk of incident coronary heart disease, fatal coronary heart disease, and stroke compared with their male counterparts. The reasons for these disparities are not completely elucidated. A greater burden of cardiometabolic risk in women was proposed as a partial explanation. Indeed, several studies suggest that women experience a larger deterioration in major cardiovascular risk factors and put on more weight than do men during their transition from normoglycemia to overt type 2 diabetes. This excess weight is associated with higher levels of biomarkers of endothelial dysfunction, inflammation, and procoagulant state [9].

The systematic review by Einarson et.al ,(2018) of 4,549,481 persons with T2DM, we estimated the overall prevalence of CVD at 32.2%. The most frequent type of CVD reported was CAD (21.2%) and lowest was stroke (7.6%). Males had higher rates of prevalent disease than females. CVD was responsible for 50.3% of all deaths in T2DM patients over the period of the review. Along with diabetes, cardiovascular disease is associated with several risk factors, obesity, and age[10].

Biochemical, Vitamin D3 and Insulin levels

Table 3 shows the Vitamin D3 and Insulin levels between patient group and control group. Means of FBS , HbA1c , Insulin , Homa-IR , TC,TG, LDL, VLDL and urea , were significantly higher for all values in patients group than that in control healthy people except the level of HDL and Vitamin D3 levels. There is no significance between both study groups in the level of creatinine, the highest significantly were in values of FBS , HbA1c, TC , TG , LDL) were (195.33-89.45 mg/dl, P= 0.001, 8.75 - 4.86 %, P= 0.001, 234.08 -158.9 mg/dl, P= 0.001, 221.25 - 83.37 mg/dl, P= 0.001 and 132.62 - 87.40 mg/dl, P= 0.001) respectively . Mean of Vitamin D3 levels were significantly lower for patients group than that in control healthy people were (12.27±2.71 - 34.37±2.43, P=0.001) respectively.

Table 3: Comparison in Biochemical tests ,Vitamin D3 and Insulin levels between Patient and control group.

Variable	Study Group		P-Value
	Patient Mean ± SD	Control Mean ± SD	
FBS (mg/dl)	195.33±19.21	89.45±7.88	0.01
HbA1C (%)	8.75±2.19	4.86±0.36	0.01
INSULIN (ng/ml)	17.48±5.42	10.92±4.11	0.05
HOMA-IR	8.32±1.40	2.41±0.83	0.01
TC (mg/dl)	234.08±44.77	158.92±29.13	0.01
TG (mIU/ml)	221.25±17.95	83.37±9.27	0.001
HDL (mg/dl)	40.71±5.53	52.82±5.61	0.05
LDL (mg/dl)	132.62±5.23	87.40±2.31	0.01
VLDL (mg/dl)	44.25±4.99	18.76±1.94	0.05
UREA (mg/dl)	50.49±8.64	27.61±6.52	0.05
CREATININE (mg/dl)	1.17±0.49	0.76±0.24	0.012
D3(ng/ml)	12.27±2.71	34.37±2.43	0.01

We found that the level of vitamins D3 was decreased in patient group that's mean there was Vitamin D3 deficiency in patients with high level in most of biochemical test for lipid profile and kidney function parameters, This explain the role of Vitamin D3 in improving these parameters.

Lipid profile has long been considered among the most important risk factors for CVD in T2DM, and several trials have confirmed that lowering low-density lipoprotein cholesterol (LDL-C) via statins in T2DM was effective in reducing the risk of CVD [11,12], It is also well known that statins also have a TG-lowering effect [13, (14)] . This paradox could mean that low triglyceride is not necessarily associated with good clinical outcomes in all people with T2DM and that there are subgroup associations with CVD in patients with different durations of T2DM. Furthermore, Clua-Espuny et al. (2018) , suggest that the relative importance of risk factors wanes in complex chronic patients with T2DM with advancing age [15] . In a cohort study of almost 3500 complex chronic patients above the age of 80 of whom 53% had diabetes and a high prevalence of associated classical risk factors, the researchers found that all causes mortality was more affected by aging factors than by specific complications of diabetes. Type 2 diabetes mellitus is associated with a cluster of lipid abnormalities (diabetic dyslipidemia) that include elevated triglyceride levels, decreased (HDL) cholesterol levels, and an increase in (LDL) particles. most people with T2DM [16]. It appears to be more frequent in women with T2DM after the age of 60 years than in men with T2DM of the same age group [17], this may be due to declines in estrogens' levels and signaling after menopause. In a large sample of people with T2DM from Sweden, women had significantly higher levels of total, LDL, and HDL cholesterol (P<.001 for all) when compared with men. Triglyceride levels were lower in women in the youngest age group (40-54 years) but higher in elderly women (≥70 years) when compared with age-matched men[18].

Several studies reported the relationship between vitamin D3 and type 2 diabetes and cardiovascular diseases such as the review of Zhiguo et.al, (2020) , was dedicated to reveal the correlation between vitamin D and adipo genesis, with emphasis on the diseases related to adipose metabolic disorders. Obesity is a common occurrence worldwide, and it can lead to diabetes. Many studies have indicated that vitamin D deficiency or insufficiency plays an important role in the development and process of obesity and diabetes [19]. Vitamin D deficiency is associated with incident cardiovascular disease. Further clinical and experimental studies may be warranted to determine whether correction of vitamin D deficiency could contribute to the prevention of cardiovascular disease.

Conclusions

The results of this study revealed that Vitamin D has important effects on insulin action, and may impact on a number of pathways which may be of importance in the development of type 2 diabetes. The vitamin D deficiency is a risk factor for various diseases with Decreased levels of vitamin D may cause insulin resistance and impaired insulin secretion . The lack of consensus in definitions of both 25(OH)D deficiency and of renal hyperfiltration, the definitions chosen are common but not universal. As with all epidemiologic studies, this investigation does not establish causality. The Vitamin D3 Deficiency showed effective on lipid profile in Type2 diabetes patients with CVD.

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Ethical Clearance: None

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