

The effect of vitamin D supplementation on blood glucose levels and lipid profile in diabetic type 2 adult in -Qatar.

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Abstract

Background: several studies show that vitamin D insufficiency can be quite prevalent even in sunny regions of the world. In the sunny Gulf region, numerous reports have demonstrated a high prevalence of low vitamin D status. In fact, the Gulf region has some of the highest vitamin D insufficiency rates in the world and Qatar is thought to have one of the highest vitamin D deficiency/insufficiency rates. The high prevalence of low vitamin D status in the Gulf region is believed to be due to several socio-cultural and other factors, *e.g.* avoiding the sun during the summer months to maintain a fair complexion (particularly among women), the intense heat, the habit of not fortifying dairy products, and incorrect supplementation. Thus, understanding the relationship between vitamin D and chronic diseases in adults and whether treatment of vitamin D deficiency can prevent or ameliorate these disorders is important (11). For that, the objective of the present study is to evaluate the efficacy of vitamin D supplementation on blood glucose levels and lipid profiles in men with type 2 diabetes with vitamin D supplementation in HMGH in Qatar. **Objective:** to evaluate the efficacy of vitamin D supplementation on blood glucose levels and lipid profiles in men with type 2 diabetes in HMGH in Qatar. **Design:** cross sectional study, A total of 136 adult males' patient with diabetic type 2 and vitamin D supplementation were included between Jan /1st / 2022 to Jan /1st / 2023. **Results:** our results showed that more than 50% of patients on 50,000IU vitamin D supplementation, the mean age and BMI were 46.65 ± 6.191 years, $28.61 \text{ kg/m}^2 \pm 6.036$ respectively. According to blood values level, Vitamin D, increased significantly after vitamin D supplementation [$(25.44 \pm 14.4) - (30.12 \pm 12.788)$, $P < 0.05$], while blood glucose levels decreased significantly after supplementation [$(9.53 \pm 4.596) - (8.71 \pm 3.717)$, $P < 0.05$]. No difference was found in terms of the other variables ($P > 0.05$). **Conclusion:** vitamin D supplementation may cause significant reduction in blood glucose levels and an improvement in serum vitamin D values.

Keywords: type 2 diabetes mellitus, vitamin D supplementation, blood glucose level.

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Introduction:

Diabetes mellitus (DM), a significant world health problem, is a metabolic disease, which occurs due to a defect in insulin release or resistance (1). Globally, the prevalence of type 2 diabetes (T2DM) is high and rising across all regions (2, 3). Diabetes prevalence in Qatar is twice the global prevalence (4). In a recent modeling study, the prevalence of T2DM among Qataris was projected to increase from 17% in 2012 to at least 24% by 2050. Obesity was found to be the principal risk factor explaining nearly two-thirds of T2DM incidence. National T2DM health expenditure was projected to account for up to 32% of Qatar's total health expenditure by 2050 (5). Vitamin D is an essential fat-soluble vitamin primarily required to maintain bone health and immunity. Recently, it has come into the limelight that vitamin D deficiency is associated with an increased risk of type 2 diabetes (6). There are many scientific studies and clinical trials claiming that vitamin D plays an important role in improving insulin sensitivity. It is known that maintaining a vitamin D level of 80 nmol/l or above is appropriate for keeping normal glucose homeostasis. The effect of vitamin D on type 2 diabetes may be driven by multiple mechanisms. For instance, studies have found that the pancreas contains receptors for the active vitamin D metabolite called 1,25-dihydroxy vitamin D, which is required for the pancreatic beta cells' synthesis and secretion of insulin (7, 8). The increasing rates of diabetes worldwide with diabetic patients reaching 400 million people, a number predicted to exceed 600 million by 2040, can justify the rapid shift of research interest towards prevention and treatment strategies for diabetes, including intervention with vitamin D (9). In particular, higher prevalence of low serum

vitamin D levels has been observed among type 2 diabetic patients [10] while higher levels of vitamin D has been associated with lower risk of type 2 diabetes [11, 12].

We are conducting this study to evaluate the efficacy of vitamin D supplementation on blood glucose levels and lipid profiles in men with type 2 diabetes and vitamin D supplementation. **Material and method:**

Sample size:

In this cross-sectional study We are extracting that sample size 279 of patient selected after reviewed their electronic medical record, 136 adult patients met the preliminary eligibility to complete the trial after reviewing their Electronic Medical Record (EMRs) and due to miss some data, the number of participants were decrease.

Measurement and Study procedure:

Historical data of all diabetic type 2 outpatient and vitamin D supplementation visited HMGH for the period from Jan -1st -2022 till Jan -1st -2023 were extracted from patients' EMRs and some lab variables and anthropometric measurement assessment was collected like (age, weight, h.t, BMI, nationality, vitamin D doses, HDL, LDL, triglyceride, fasting blood glucose, cholesterol and HbA1C).

The inclusion criteria:

outpatients of Hazm Mebareek General Hospital (HMGH) in Qatar with type 2 diabetes and vitamin D supplementation who were admitted for the period between Jan -1st-2022 till Jan -1st -2023 and the exclusion criteria, Patients with type 1 diabetes, Patients without vitamin D supplementation, Patients with other comorbidities may affect vitamin D levels.

Statistical analysis:

The Statistical Package for Social Sciences (SPSS version 21) was used for data analysis, and data were presented as mean ± standard deviation. The descriptive statistics of participants were obtained by determining frequency distributions of categorical data and weighted means and standard errors of continuous variables, such as age, height, BMI, and weight. Significant differences in variables between after and before supplementation groups were analyzed using the student t test. Level of statistical significance was set at < 0.05.

Results:

Among the total of 136 patients with type 2 diabetes, the mean age of the study population was 46.65 ± 6.191 years, BMI was 28.61 kg/m² ± 6.036, height was 170.16 ± 16.964 and the mean of weight was 88.32 ± 19.813, while the percentage of vitamin D supplementation dose was 6% for 1000 IU vitamin dose, 84.6% for 50.000 IU and 9.4% for 100.000 IU. As shown in **Table 1**. On the other hand, our results showed that there were a significant difference in mean values before and after vitamin D supplementation in serum blood level of vitamin D values (25.44 to 30.12 ± SD, p < 0.05), blood glucose levels (9.53-8.71 ± SD, p < 0.05) with no difference in mean value of other lipid profile level. As shown in **Table 2**.

Table 1. Characteristics of the study patients (136).

characteristics	means ± SD/(n%)
Age	46.65 ± 6.19
BMI	28.61± 6.04
HT	170.16 ± 16.96
WT	88.32 ± 19.813
Nationality	
Qatari	17 (11.4)
Non-Qatari	89 (59.7)
Arabic	43 (28.9)
Vitamin D dose	
1000 IU	9 (6)
50.000 IU	126 (84.6)
100.000 IU	14 (9.4)

Table 2. Comparison of study variables (means \pm SD) before (1) and after (2) vitamin D supplementation.

Variables	Time	means \pm SD	P- values
Serum vitamin D	1	25.44 \pm 14.43	0.00
	2	30.12 \pm 12.79	
Serum LDL	1	2.31 \pm 0.90	0.47
	2	2.26 \pm 0.92	
Serum HDL	1	1.03 \pm 0.22	0.93
	2	1.03 \pm 0.24	
Serum TRIGLECERIDE	1	1.82 \pm 0.90	0.51
	2	1.86 \pm 0.92	
Serum CHOLESTEROL	1	4.15 \pm 1.02	0.78
	2	4.13 \pm 1.07	
Serum GLUCOSE	1	9.53 \pm 4.60	0.02
	2	8.71 \pm 3.72	
Serum HbA1C	1	7.41 \pm 1.41	0.83
	2	7.39 \pm 1.46	

Discussion:

Vitamin D deficiency is now regarded as a potential risk factor for T2DM [13,14]. In this study, results show that vitamin D serum increase decreased blood sugar levels with no effect on HbA1c. It seems that higher vitamin D level increases cells sensitivity to insulin, as smaller amount of insulin is needed to maintain the blood sugar level within the normal range, especially in post-meal metabolic conditions. Results from epidemiologic and in vitro studies suggest a correlation between vitamin D status and blood sugar control [15-18]. Vitamin D may directly increase insulin sensitivity through stimulating the expression of insulin receptor or activating peroxisome proliferator activated receptor gamma (PPAR- γ), a factor that regulates fatty acid metabolism in skeletal muscle and adipose tissue. Vitamin D can also affect the insulin secretion and sensitivity through regulating intracellular calcium concentration [19]. Studies showed no significant change in fasting glucose level of people who were within normal glucose range and took vitamin D supplements, whereas, with respect to the people with glucose intolerance, there was a slight but significant reduction in fasting glucose level in vitamin D group relative to the control group [20]. A meta-analysis by Jamka et al. [21] is the latest publication on the effect of vitamin D supplementation on sugar and insulin serum. In this meta-analysis, 11 clinical trials, comprised of 1,181 subjects, have been reviewed. The mean blood sugar level among them was 82-102mg/dL. Nine out of the eleven studies have investigated blood sugar changes caused by vitamin D supplementation. In seven studies, the supplementation decreased blood sugar, whereas two studies reported an insignificant reduction.

Observational studies reported an inverse correlation between higher levels of serum 25OHD and lower levels of total serum cholesterol, LDL, TG, and higher levels of serum HDL [22]; but the results of RCTs to evaluate the effects of vitamin D on lipid profile are conflicting. The exact mechanism by which vitamin D affects lipid markers is not clear. In the present study, we found no significant decrease in lipid profile levels after vitamin D supplementation. It has been demonstrated that vitamin D increases lipoprotein lipase (LPL) gene expression in muscles and adipose tissue. The activation of LPL increases the clearance of circulating lipoprotein particles and modifies the lipid profile in favor of reducing atherosclerosis. The most obvious effects of LPL are reduction in serum TG and increase in serum HDL [23]. Hypertriglyceridemia, low serum HDL, and decreased adipose tissue LPL activity are common in diabetic patients. Therefore, vitamin D administration could have benefits for these subjects. Although pooling the data from RCTs showed that vitamin D did not significantly reduce serum TG, subgroup analyses demonstrated that administration of vitamin D \leq 2000 IU per day significantly reduced serum TG (\sim 19 mg/dl) in patients with T2D. Finally, we concluded that vitamin D supplementation may improve glycemic control in patients with T2DM with no effect on lipid profile level.

Declaration of interest:

The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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