

Effect of Vitamin E on Blood Glucose, Lipid Profile and Blood Pressure in Type 2 Diabetic Patients

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ABSTRACT

OBJECTIVE: Type 2 diabetes is associated with elevated oxidative stress and decline in antioxidant defense. Vitamin E supplementation reduces oxidative stress level in diabetic patients. Purpose of this study was to evaluate the effect of vitamin E supplementation on glycemic control and lipid profile in type 2 diabetic patients.

MATERIAL AND METHODS: In this study 31 type 2 diabetic patients with Fasting blood Sugar (FBS):140-200 mg/dl, Triglyceride (TG): 200-400 mg/dl, Cholesterol (TC): 200-300 mg/dl and mild hypertension were selected. Subjects received vitamin E 800 IU/day for 3 months. At the baseline and end of the study FBS, TC, TG, LDL, HDL, Glycated hemoglobin and fasting insulin level were measured.

RESULTS: In this study 31 type 2 diabetic patients (19 female, 12 male) with mean age 53.03 ± 8.87 years were studied. Vitamin E supplementation for 3 months had no positive effect on type 2 diabetic patients. As FBS, TG and fasting insulin decreased but this decline was not significant. Also total Cholesterol, systolic and diastolic blood pressure changes were not remarkable.

CONCLUSION: Results of this study showed that 800 IU vitamin E administration for 3 months could not improve blood glucose, lipids, HbA1c, fasting insulin, systolic and diastolic BP in type 2 diabetic patients.

KEY WORDS: Type 2 diabetes, Vitamin E, Insulin, Glycated hemoglobin.

INTRODUCTION

Diabetes mellitus is a common disease worldwide. The prevalence and incidence of diabetes are increasing in most populations, being more prominent in developing countries (1). The number of diabetic patients in Iran is estimated around 1.5 million now (2).

The diabetes control and complication trial has convincingly shown that complication of diabetes can be delayed and reduced by maintaining tight glycemic control (3). Over the last decade, there has been a significant interest in oxidative stress and its role in the development of complications in diabetic patients (4).

Several studies have shown increasing of

stress oxidative in diabetic patients especially individuals with poor glycemic control (5). Recently hyperglycemia has been shown to be the most important factor in free radicals production in diabetes that increase super oxide radicals in mitochondria (9,10 and 11).

It was reported that the level of serum alpha tocopherol is lower in type 2 diabetic patients compared to healthy subjects (12,13). Administration of alpha tocopherol can delay chronic complications (14). Also alpha tocopherol has beneficial effects on metabolic control due to its antioxidant activity which influences lipid oxidation, protein glycation and insulin sensitivity (15).

Several researches revealed that vitamin E

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supplementation could improve glycemic control (16,18). Nevertheless, some randomized clinical trials could not approve these effects (19,21). Accordingly this study was performed to recognize the effects of vitamin E on metabolic responses in type 2 diabetic patients.

MATERIALS AND METHODS

Thirty one type 2 diabetic patients aged 30-70 years with Fasting Blood Sugar (FBS) 140-200 mg/dl, 2 hour post prandial blood glucose (2hpp), 250 mg/dl, triglyceride (TG) <400 mg/dl, Total Cholesterol (TC) \leq 300 mg/dl and mild hypertension (22) were recruited from Yazd Diabetes Research Center.

Exclusion criteria included: cigarette smoking, current treatment with anti-inflammatory or other medications except oral hypoglycemic agent, diabetic complications, using antioxidant supplements, renal failure, coronary artery disease, congestive heart failure, hypercalemia, uncontrolled hypertension, history of CVA, chronic liver disease, pulmonary infection, pregnancy and lactation (23,24). Patients who had changed dosage or types of medications were excluded. The included patients received 400 IU vitamin E twice a day for 3 months. Demographic information was recorded for each patient.

Laboratory methods: FBS, TG, TC, HbA1c and HDL were measured in the basal state and

after 3 months of treatment. Serum glucose and lipids were measured by colorimetric methods (GPO-PAP) with Photometer 5010 and Parsamon lit (Iran). HbA1c was measured using DS5 analyzer and DS5 Pink Reagent kit. Fasting serum insulin was measured by Elisa and Q-1-Dia Plus lit (USA).

Blood pressure was measured in the base-line and after 3 months. It was measured in three positions (supine, sitting and upright) in 5 minutes intervals and the mean of them was calculated.

The homeostasis Model Assessment (HOMA) index of insulin sensitivity was calculated as follows: $HOMA = \text{fasting insulin} \times \text{fasting glucose} / 22.5$ (23).

Statistical analysis: Statistical analysis was performed using Statistical Package for Social Sciences (SPSS 12.0, Chicago IL). To compare before and after metabolic responses paired T-test was used. Significance was considered to be $P < 0.05$. Results were given with their 95% CIs. Data were presented as means \pm SD.

RESULTS

In this study 31 type 2 diabetic patients (19 female, 12 male) with mean age of 53.03 ± 8.87 years and diabetes duration 2.16 ± 0.89 years were evaluated. Table 1 shows the mean variables before and after vitamin E.

Table 1- Mean variables before and after vitamin E

Variables	Before vitamin E	After vitamin E	P value
BMI (kg/m ²)	29.3 \pm 4.26	29.22 \pm 04.39	0.3
FBS (mg/dl)	162.58 \pm 18.7	160.51 \pm 43.86	0.7
HbA1C (%)	9.61 \pm 1.80	10.09 \pm 2.13	0.1
Tg (mg/dl)	240.09 \pm 55.77	223.45 \pm 75.92	0.1
Total Chol (mg/dl)	200.54 \pm 33.71	198.87 \pm 43.79	0.8
LDL (mg/dl)	105.87 \pm 31.18	114.82 \pm 43.38	0.2
HDL (mg/dl)	47.63 \pm 16.58	41.43 \pm 9.56	0.07
Systolic BP (mmHg)	134.51 \pm 15.98	132.58 \pm 15.43	0.4
Diastolic BP (mmHg)	82.41 \pm 6.93	81.29 \pm 8.36	0.3
Fasting insulin (μ IU/ml)	15.23 \pm 11.41	10.78 \pm 6.85	0.06
HOMA	107.18 \pm 77.96	85.49 \pm 86.37	0.2

DISCUSSION

In this study FBS, Triglyceride and fasting insulin decreased, but this decline was not significant. Total cholesterol, systolic and diastolic blood pressure changes were not remarkable.

There are controversial points about effects of vitamin E on glycemic control. Some studies have shown vitamin E can improve blood sugar in diabetic patients. Gazis et al. showed 1600 IU alpha tocopherol supplementation significantly reduced HbA1c levels (25). Jain et al. have shown this reduction by 100 IU vitamin E in type 1 diabetic patients (26). Also this reduction was seen in the studies by Paolisso et al. (27) and Ceriella et al. (28).

In our study no significant changes in HbA1c were observed. It might be due to use of high dosage of vitamin E in other studies that could cause toxicity. Such these results were shown in other studies (14,29 and 30). In Ble Castilo's study, administration of 800 IU/day alpha tocopherol for 6 weeks has not beneficial effect on serum glucose and HbA1c in type 2 diabetic women (14).

High dose vitamin E supplementation can improve insulin activity and decrease fasting insulin with oxidative stress reduction. In one study it was seen that 900 IU/day vitamin E can improve insulin due to oxidative stress reduction (31). Manzella et al. showed 600 IU/day vitamin E supplementation reduced HbA1c, plasma insulin, HOMA and also oxidative stress indexes (16). Nevertheless, some studies did not accomplish to show the effect of vitamin E on HOMA and oxidative stress (23,32 and 17).

In our study HOMA decreased but this was not significant. It might be due to poor diabetes control in our patients.

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Some studies have shown that vitamin E has beneficial effects on plasma lipids (17,26). In Paolisso's study vitamin E administration reduced triglycerides, total cholesterol and LDL (27). In another research 100 IU/day vitamin E in diabetic patients reduced serum triglycerides significantly (26). While some studies did not show the effect of vitamin E on lipids (20,31 and 32).

There is inverse relationship between serum vitamin E level and blood pressure (33). Some studies have shown that vitamin E reduces blood pressure (34). In Boshtam's study 70 subjects who had mild blood pressure randomly received 200 IU/day vitamin E or placebo. The results of this study showed that vitamin E administration can reduce blood pressure significantly (35). While another studies did not show the beneficial effect of vitamin E on blood pressure (36).

CONCLUSION

Overall, in our study FBS, fasting insulin and HOMA decreased, but it was not significant. Perhaps this was due to insufficient samples, dosage or short duration of research. So, further studies with longer duration and higher dosage are suggested.

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