ORIGINAL RESEARCH

Measurement of vitamin A and vitamin E levels in patients with controlled and uncontrolled DM

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ABSTRACT

Background: To evaluate the levels of antioxidant vitamins A and E in both controlled and uncontrolled Type 2 diabetes mellitus (T2DM) patients. **Materials and methods:** In this study, 40 patients with Type 2 diabetes mellitus (T2DM) and HbA1c levels below 7%, within the age range of 30-60 years, were included as cases. Additionally, 40 patients with T2DM and HbA1c levels above 7%, within the same age range, were included as controls. Data analysis was done using SSPS software. **Results:** Lower levels of vitamin A and E in Group 2 (uncontrolled) T2DM subjects compared to Group 1 (controlled) T2DM subjects were seen. **Conclusion:** Controlled diabetes patients exhibited relatively higher levels of Vitamin A and E compared to patients with uncontrolled Type 2 Diabetes Mellitus (T2DM).

Keywords: diabetes, hyperglycemia, deficiency

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a complex condition characterized by varying levels of insulin resistance and pancreatic β-cell dysfunction, leading to chronic high blood sugar levels. This hyperglycemia can cause tissue damage through oxidative stress pathways.[1]

Vitamin A is a crucial fat-soluble micronutrient with strong antioxidant properties. Apart from its antioxidant function, vitamin A plays diverse roles in cell regulation, endocrine development, and pancreatic function.[2] Deficiency of vitamin A is common in developing countries due to poor nutrition, and studies have found lower levels of serum vitamin A in diabetic individuals compared to non-diabetics. Evidence also suggests that daily intake of vitamin A can improve pancreatic β-cell function and potentially delay the progression from pre-diabetes to T2DM. [3]

Vitamin E, another important antioxidant, particularly in the form of alpha-tocopherol, has been shown to reduce oxidative stress and associated damage in T2DM.[4] Some observational studies have suggested that vitamin E supplementation may have beneficial effects on glycemic control in T2DM.[5]

Several studies have reported conflicting findings regarding the levels of Vitamin A and Vitamin E in patients with diabetes mellitus. While some studies have indicated a high level of these antioxidants in diabetes mellitus patients, others have shown low levels. Additionally, certain studies have found no significant difference in the levels of antioxidant vitamins between diabetes mellitus patients and controls.[6,7] Given this conflicting evidence, the current study aimed to evaluate the levels of antioxidant vitamins A and E in both controlled and uncontrolled Type 2 diabetes mellitus (T2DM) patients.

MATERIALS AND METHODS

In this study, 40 patients with Type 2 diabetes mellitus (T2DM) and HbA1c levels below 7%, within the age range of 30-60 years, were included as cases. Additionally, 40 patients with T2DM and HbA1c levels above 7%, within the same age range, were included as controls.

Exclusion criteria for the study comprised patients with hyperlipidemia and systemic diseases such as kidney disease, neuropathy, cardiovascular disease,

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liver disease, and heart disease. Data analysis was done using SSPS software.

RESULTS

The subjects were divided into three age groups. The age group of 30-40 years had the fewest subjects, while the age groups of 51-60 years had the highest number of subjects. Lower levels of vitamin A and E in Group 2 (uncontrolled) T2DM subjects compared to Group 1 (controlled) T2DM subjects were seen. The comparison of HbA1c (%), vitamin E and vitamin A in group 1 and group 2 was statistically significant.

Table 1: Comparison of age between Group 1 (controlled) T2DM and Group 2 (uncontrolled) T2DM

Age group(years)	Group 1(controlled T2DM)	Group 2(uncontrolled T2DM)	P -value
30-40	4	7	0.722
41-50	10	11	
51-60	26	22	
TOTAL	40	40	

Table 2: Comparison of Biomarker Levels in Controlled and Uncontrolled Type 2 Diabetes Mellitus (T2DM) Groups

Variable	Group 1(controlled T2DM)	Group 2(uncontrolled T2DM)	P value
HbA1c (%)	5.90	9.11	<0.01*
Vitamin E (mg/dl)	1.05	0.60	<0.01*
Vitamin A (µg%)	21.10	14.21	<0.01*

DISCUSSION

Vitamin A and E in patients with Type 2 Diabetes Mellitus (T2DM) is crucial for comprehending the intricate interplay between nutrition and metabolic health. In individuals with T2DM, the balance of these vitamins can be significantly influenced by the disease's management status. Controlled diabetes often correlates with more stable vitamin levels, reflecting better nutritional intake and metabolic control, whereas uncontrolled diabetes may lead to fluctuations due to increased oxidative stress and metabolic disturbances.[8,9]

Within diabetes mellitus, free radicals play a significant role in instigating inflammation and oxidative stress. The scavenging properties of vitamin E serve to alleviate this oxidative stress. Vitamin E functions by disrupting the chain reaction of lipid peroxidation through its interaction with lipid peroxy radicals, thereby safeguarding cells from oxidative harm.[10]

The current study undertook a comparison of HbA1c, vitamin A, and vitamin E levels in individuals with controlled and uncontrolled Type 2 Diabetes Mellitus (T2DM). In contrast to prior investigations by Firoozrai M et al.[11] and Onyesom I and Agho JE[12], which examined vitamin A and E among diabetic cohorts relative to non-diabetic cohorts, this study introduced a distinctive stratification of diabetic patients into controlled and uncontrolled categories based on their HbA1c levels.

In diabetes mellitus (DM), there is an escalation in polyol pathways, augmented formation of glycation end products, activation of protein kinase C, and increased hexosamine pathway. These processes collectively elevate the production of superoxide, leading to heightened oxidative stress in DM [13]. The generation of free radicals, precipitating oxidative stress and tissue damage, chiefly arises from non-enzymatic glycation between glucose and the amino group of proteins.[14,15]

In the present study, lower levels of vitamin A and E in Group 2 (uncontrolled) T2DM subjects compared to Group 1 (controlled) T2DM subjects were seen. The comparison of HbA1c (%), vitamin E and vitamin A in group 1 and group 2 was statistically significant.Said E et al compared the effect of high-dose vitamin A plus E supplementation (AE) versus high-dose vitamin A plus E with zinc (AEZ), on different diabetic parameters. Ninety-eight patients with T2DM were randomized to receive either: 50,000 IU vitamin A and 100 mg vitamin E (AE group, N = 36), an equivalent dose of vitamin A and E combined with 25 mg zinc (AEZ group, N = 35), or no supplements (control group, N = 27) for three months. Compared to control, AEZ group showed significant reductions in fasting blood glucose, 2 h postprandial blood glucose, and glycated hemoglobin (HbA1c) with significant increases in homeostasis model assessment of beta-cell function and difference value of fasting insulin. Two hair loss cases were recorded in both treated groups. Although vitamin A needs dose moderation, these results suggest that, high-dose vitamin A plus E supplementation combined with zinc may improve glycemic control, β-cell function, and insulin secretion in adults with T2DM.[16]Baburao Jain A et al assessed the role of vitamin E in preventing the development and the progression of the diabetic complications.Both type I and II DM patients with and without complications were included in this study. They were divided separately into the test (which received insulin/oral hypoglycemic and vitamin E) and the control groups (which received only insulin/oral hypoglycemic drugs). It was evident from the analysis of the data that the PPBS, TC and the Diastolic Blood Pressure (DBP) declined gradually and significantly in the test groups. This was a beneficial development for the

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diabetic patients. The patients who were on the vitamin E supplementation had a delayed development and a slow progression of the complications.Vitamin E supplementation has an important role in delaying the onset of the diabetic complications as well as for slowing down the progression of the complications.[17]

CONCLUSION

Controlled diabetes patients exhibited relatively higher levels of Vitamin A and E compared to patients with uncontrolled Type 2 Diabetes Mellitus (T2DM).

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