

Study of Vitamin C and Vitamin E Levels in Relation to Diabetic Dyslipidemia

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Abstract

Hyperglycemia in DM is associated with increased lipid peroxidation and excessive production of free radicals which lead to oxidative stress by autoxidation of glucose. It is an important pathogenic mechanism in the development of diabetes and its complications. The research work included 100 patients with type 2 diabetes mellitus (age group 30-60 years). Fasting blood samples collected using aseptic technique were evaluated for serum levels of the fasting blood glucose, triglycerides, total cholesterol, HDL, LDL, vitamin C and vitamin E by spectrophotometric method. It was observed that serum level of vitamin C and vitamin E are significantly low ($p < 0.05$) in diabetic patients with dyslipidemia as compared to patients without dyslipidemia.

Key words:- Diabetes; Dyslipidemia; Vitamin C; Vitamin E.

Introduction

Diabetes is the commonest metabolic disorder affecting the people all over the world. A key component of the insulin resistance syndrome (IRS) is hyperglycemia induced dyslipidemia. A characteristic pattern, termed diabetic dyslipidemia, consists of decrease high density lipoprotein (HDL), increased triglycerides, increased low-density lipoprotein (LDL) and postprandial lipemia. This pattern is most frequently seen in type 2 diabetes and may be a treatable risk factor for subsequent cardiovascular disease.

Hyperglycemia in DM is associated excessive production of free radicals and reactive oxygen species (ROS) which lead to the oxidative stress by autoxidation of glucose. The increased lipid peroxidation and oxidative stress in diabetes has been attributed to the increased plasma glucose levels.

The free radicals can directly attack critical target molecules or attack polyunsaturated fatty acids (PUFA) in membranes an initiate lipid peroxidation. The PUFAs are degraded to a variety of products, some of them as aldehydes (4-

hydroxynoneal, 4-hydroxyhexenal and malondialdehyde) are very reactive and have the potential to damage molecules within or outside the plasma membrane.

Thus hyperlipidemia and hyperglycemia have been associated with increased oxidative damage affecting lipoproteins and the antioxidant status. Increases of serum lipid and carbohydrate levels lead to increased oxidative stress, which has been associated with increased risk for atherosclerosis and related disorders. Several studies have addressed the possible participation of dietary antioxidants, such as vitamins, in ameliorating the diabetic state and retarding the development of diabetes complications (1).

A variety of natural antioxidants exist to scavenge oxygen free radicals and prevent oxidative damage to biological membranes. The most important non-enzymatic antioxidants are vitamin E and vitamin C. Vitamin E acts to protect polyunsaturated fatty acids (PUFA) and LDL-c particles from oxidation by interrupting the chain of membrane lipid peroxidation (2). Vitamin C is an important antioxidant capable of scavenging oxygen-derived free radicals. Vitamin C has a role in scavenging ROS by becoming oxidated itself. The oxidized products of vitamin C, ascorbic radical and dehydroascorbic radical are regenerated by glutathione, NADH or NADPH. In addition, vitamin C can reduce the oxidized forms of vitamin E and glutathione and has been shown to regenerate them (3).

Study area

The study was carried out in Department of Biochemistry, Govt. Medical College, Kota, Rajasthan from June 2012 to Dec. 2012. For the study 100 patients with type 2 diabetes mellitus (fasting blood glucose > 126 mg/dl) between 30-60 years of age were selected from the general population of Kota district and screened for hypertension.

After overnight fasting, venous blood of the subjects was drawn from antecubital vein using aseptic techniques. Samples were collected in plain vials. The samples were left standing for one hour and serum was separated.

Material and methods:- After overnight fasting, venous blood samples was collected using aseptic technique. The serum was analyzed of glucose, triglycerides, total cholesterol, HDL, LDL, vitamin C and vitamin E by spectrophotometric method. On the basis of lipid profile the patients were categorized into 2 groups diabetic with dyslipidemia and diabetic without dyslipidemia. Dyslipidemia was labelled based according to ATP (*Adult Treatment Panel*) III classification for lipid profile (4). Data were statistically analyzed using Microsoft excel 2007 and expressed as Mean \pm SD.

Results:- It was observed that out of 100 diabetic patients included in study 59 patients found dyslipidemic. The mean vitamin C value was 0.86 ± 0.201 mg/dl in diabetics with dyslipidemia and 1.10 ± 0.206 mg/dl in diabetics without dyslipidemia. The mean vitamin E was 0.89 ± 0.105 mg/dl and 1.02 ± 0.097 mg/dl in diabetics with and without dyslipidemia respectively. Statistical analysis shows that the blood levels of vitamin C and vitamin E are significantly low ($p < 0.05$) in diabetic patients with dyslipidemia as compared to patients without dyslipidemia (table-1).

Table-1: Comparison of Blood Levels of Vitamin C and Vitamin E in both the 2 Groups

Parameters	Diabetics with dyslipidemia (Mean ± SD)	Diabetics without dyslipidemia (Mean ± SD)	Student t test (p value)
Vitamin C (mg/dl)	0.86 ± 0.201	1.10 ± 0.206	p=2.00897E-12, (p<0.05) Significant
Vitamin E (mg/dl)	0.89 ± 0.105	1.02 ± 0.097	p=3.01484E-12, (p<0.05) Significant

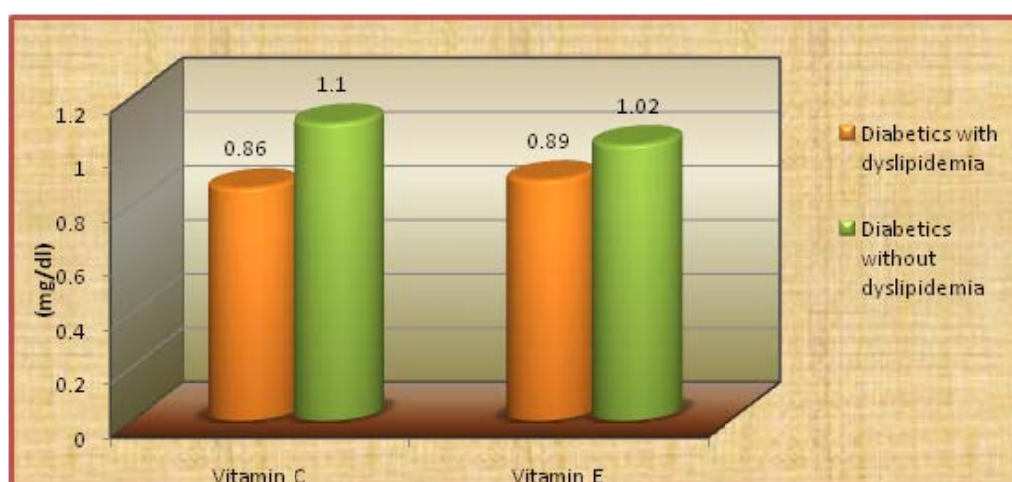


Figure 1: Comparison of Blood Levels of Vitamin C & Vitamin E in diabetics with and without dyslipidemia

Discussion

Hyperglycemia has been established as a necessary factor in the development of diabetic complications. Increased oxidative stress is a widely accepted participant in the development and progression of diabetes and its complications. Diabetes is usually accompanied by increased production of free radicals or impaired antioxidant defences.

The present study demonstrated that serum level of vitamin C and vitamin E is a significantly low in diabetics with dyslipidemia as compared to diabetics without dyslipidemia.

Our results are in agreement with Rahimia et al., (2005) whose study indicated that the use of antioxidants reduces oxidative stress in diabetes (5). Both vitamin C and vitamin E decreased lipid peroxidation and increased the activities of antioxidant enzymes in T2DM, which is in agreement with Kedziora- Kornatowska et al., (2003) study in rats (6). Vitamin C was found to be significantly decreasing the elevated levels of glucose, cholesterol, triglycerides and low-density lipoprotein (LDL) in T2DM.

Paolisso et al. (2007) also reported beneficial effects of oral vitamin C (1000 mg/day for 4 months) on glucose, lipid metabolism, and free radicals in T2DM (7). Other study suggested that vitamin E administration is associated with decreased

glycosylation of hemoglobin, some serum proteins, and decreased susceptibility of LDL to oxidation. Vitamin C is required for regeneration of α -tocopherol (vitamin E) and may thus prevent LDL oxidation, and transport of α -tocopherol in HDL. This may enhance and preserve these protective antioxidant effects of HDL. Vitamin E supplementation may have special benefits in preserving HDL antioxidant function in diabetic subjects (8). It has been shown decreased levels of lipid profile, lipid peroxidation and free radical production by vitamin E and C supplementation (9).

Conclusion

Our study has revealed a trend towards low serum levels of vitamin C and Vitamin E in diabetic patients with dyslipidemia as compared to patients without dyslipidemia. This indicates the protective role of antioxidants in development of dyslipidemia in diabetics.

References

- [1] Cuerda, C., et al., 2011, "Antioxidants and diabetes mellitus: review of the evidence," *Nutr Hosp*, 26(1), pp. 68-78.
- [2] Afkhami-Ardekani, M., et al., 2009, "The effect of vitamins C and E supplementation on insulin level, HbA_{1c} and blood glucose in type 2 diabetic patients," *J Beh Kerm Univ MedSci*, 11, pp. 12-8.
- [3] Garcia-Bailo, B., et al., 2011, "Vitamins D, C, and E in the prevention of type 2 diabetes mellitus: modulation of inflammation and oxidative stress," *Biologics*, 5, pp. 7-19.
- [4] "Executative summary of the third report of the National Cholesterol Education program (NCEP) Expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel III)," *JAMA*, 2001, 285(19), pp. 2486-97.
- [5] Rahimia, R., et al., 2005, "A review on the role of antioxidants in the management of diabetes and its complications," *Biomedecine & Pharmacotherapy*, 59 (7), pp. 365-373.
- [6] Kedziora-Kornatowska, K., et al., 2003, "Effect of Vitamin E and Vitamin C supplementation on antioxidative state and renal Glomerular basement membrane thickness in Diabetic Kidney," *Experimental nephrol*, 95 (4), pp. 34-43.
- [7] Paolisso, G., et al., 2007, "Metabolic benefits deriving from chronic vitamin C supplementation in aged non-insulin dependent diabetics," *J Am Coll Nutr*, 14, pp. 387-392.
- [8] Gowri, M. S., et al., 2009, "Decreased protection by HDL from poorly controlled type 2 diabetic subjects against LDL oxidation may be due to its abnormal composition," *Atheroscler Thromb Vasc Biol*, 24, pp. 816-23.
- [9] Upritchard, J. E., et al., 2008, "Effect of supplementation, vitamin E and vitamin C on LDL oxidation and products of inflammatory activity in type 2 diabetes," *Diabetes Care*, 23, pp. 733-738.