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Original Research Article

Effect of Oral Vitamin E on Serum Lipid Profile of Apparently Healthy Nigerians in Benin City

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Abstract

Purpose: *To investigate the effect of oral vitamin E on serum lipid profile of Apparently Healthy Nigerians in Benin City*
Methods: *Fifty eight apparently healthy non-smoking males aged 30 - 59 years were randomly selected from Benin metropolis and were divided in three groups. The effect of oral vitamin E (a potent antioxidant) supplementation in various dosages 100 mg/day,200 mg/day and 400 mg/day for 21 days on Total cholesterol, Triglycerides, High Density Lipoprotein, Low Density Lipoprotein and Very low Density Lipoprotein was examined.*
Results: *The serum total cholesterol, triglycerides, low density lipoprotein and very low density lipoprotein of the subjects showed a decrease which was not statistically significant ($p > 0.05$) after treatment with various doses of oral vitamin E.*
Conclusion: *The effect of oral vitamin E on blood lipids is not significant when administered alone to healthy male subjects. This may be due to the function of α- tocopherol (vitamin E) as a pro-oxidant in the formation of lipid radical via α- tocopherol mediated pathway.*

Keywords: *Atherosclerosis, Pro-oxidant, Vitamin E, Antioxidants, Lipid profile, Dyslipidaemia*

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INTRODUCTION

Man interacts with his environment on a daily basis either during work or through food and are exposed to various chemicals. These chemicals may be oxidants or pro-oxidants, which are capable of initiating and enhancing lipid peroxidation and oxidizing pulmonary proteins. These oxidants are reduced, quenched or neutralized by antioxidants [1]. Cellular and tissue antioxidant defenses are enzymatic (superoxide dismutase, catalase and glutathione peroxidase), dietary micronutrients (vitamin E, vitamin C, β-carotene and selenium) and acute phase proteins (albumin and ceruloplasmin) [1].

Vitamin E is well recognized for its role in maintaining membrane integrity and protection from reactive oxygen species which has been implicated in both carcinogenesis and arterial injury by ischemia. As an antioxidant, it is capable of stopping the propagation of potent oxidants formed during cellular metabolism or introduced as toxic chemicals. It prevents peroxidation of membrane phospholipids [2]. Disorders of blood lipid levels promote atherosclerosis which is recognized as a major risk factor for cardiovascular disease (CVD) such as stroke, coronary artery disease and peripheral vascular disease [3].

The prevalence of lipid abnormalities in humans has shown a steady rise in various countries of the world over the years [3]. Several lipids studies have been carried out in different countries over the years. Dawber *et al* in their work demonstrated clearly that persons with elevated serum cholesterol have increased risk for atherosclerotic heart disease [4]. Adedeji observed lower serum lipid levels in healthy Nigerians than Caucasians [5]. There is a high correlation between total cholesterol or lipids in the serum and the concentration of Vitamin E [6]. Based on the association between lipids and vitamin E which is as an antioxidant, we sought to determine the distribution of blood lipids in apparently healthy Nigerians and evaluate the effect (if any) of vitamin E supplementation on the serum lipid profile of humans.

EXPERIMENTAL

Study population

A total of 54 apparently healthy volunteers (30 - 59 years of age) with a mean age of 25 ± 3.0 were randomly recruited with Benin City,Nigeria for this study. Each subject was fully informed and verbal consent obtained and also completed an extensive questionnaire regarding his medical history and lifestyle including cigarette and drug usage, alcohol consumption, and intake of nutritional supplements, as well as demographics. The volunteers were divided into three groups (A, B, C) of 18 males each. Exclusion criteria include cigarette smoking, alcohol consumption, multivitamin supplement or tablet intake, hypertension, diabetes as well as impaired renal and liver functions. This work was guided in terms of ethics by Helsinki Declaration (2008) [7] and ethical clearance for the work was obtained from ethical committee of the Edo State Ministry of Health (ref no. ED/MOH/11/56/15/024.

Collection of samples

Fasting venous blood was collected from all volunteers with minimum stasis into plain container, allowed to clot and spun at 4000 rpm for 10 m. The serum was separated and kept frozen as control (pre-test samples) before the subjects were administered vitamin E tablets. Group A was received 100 mg/day of vitamin E, Group B 200 mg/day of vitamin E while Group C was supplemented with 400 mg/day of Vitamin E for 21 days. After the treatment period, fasting venous blood was collected aseptically into plain containers, allowed to clot and spun at 4000 rpm for 10 m. The serum was separated and kept frozen until analysis. These served as test samples.

Biochemical analysis

Serum lipids and lipoproteins were analyzed by using the enzymatic CHOD-PAP method. LDL-cholesterol, VLDL-cholesterol, Atherogenic and Coronary Risk Indices, and Non-HDL – Cholesterol (Apo-lipoprotein B surrogate marker) were calculated. All the test kits used were commercially obtained from Randox Laboratories UK. In all the analyses, the manufacturer`s instructions were adhered to strictly.

Statistical analysis

The group mean ± SD was computed for each analyte and significant difference between means was evaluated using Student's t-test with the aid of Statistical Package for Social Science SPSS version 16.0 software (SPSS Inc., Chicago, IL USA) for Windows. $P < 0.05$ was considered statistically significant.

RESULTS

Table 1 and Fig 1 show the lipid profile of individuals who were received 100 - 400 mg/day of Vitamin E for 21 days. All parameters showed no significant difference ($p > 0.05$) from their control for all the groups. Furthermore, inter-group differences for all the parameters were also not significant ($p > 0.05$).

Table 1: Serum total cholesterol, triglycerides, HDL-C, LDL-C, VLDL-C (mg/dl) AI, CRI and Non-HDL-C of individual's pre and post stimulation with 100 mg/day of Vitamin E

	PRE	POST	*p*-value
Total Cholesterol	135.0±22.6	133.5±20.1	$p > 0.05$
Triglycerides	105±11.9	98.8±10.9	$p > 0.05$
HDL-C	55.0±18.3	58.6±16.7	$p > 0.05$
LDL-C	58.8±1.9	57.0±1.4	$p > 0.05$
VLDL-C	21.2±2.4	19.8±2.0	$p > 0.05$
AI	2.5±1.2	2.3±1.2	$p > 0.05$
CRI	1.1±0.1	1.0±0.1	$p > 0.05$
Non-HDL-C	80.0±4.3	74.8±3.4	$p > 0.05$

Table 2: Serum Total Cholesterol, Triglycerides, HDL-C, LDL-C, VLDL-C (mg/dl) AI, CRI and Non-HDL-C of individual's pre and post stimulation with 200 mg/day of Vitamin E

	PRE	POST	*p*-value
Total Cholesterol	135.0±21.1	130.5±18.0	$p > 0.05$
Triglycerides	106.8±10.8	96.4±11.0	$p > 0.05$
HDL-C	55.8±11.6	62.1±12.8	$p > 0.05$
LDL-C	57.8±7.3	48.6.4±3.6	$p > 0.05$
VLDL-C	21.4±2.2	19.3±1.6	$p > 0.05$
AI	2.4±1.8	2.1±1.4	$p > 0.05$
CRI	1.0±0.6	0.8±0.3	$p > 0.05$
Non-HDL-C	79.2±9.5	67.9±5.2	$p > 0.05$

Table 3: Serum Total Cholesterol, Triglycerides, HDL-C, LDL-C, VLDL-C (mg/dl) AI, CRI and Non-HDL-C of individual's pre and post stimulation with 400 mg/day of Vitamin E

	PRE	POST	*p*-value
Total Cholesterol	1320±22.1	129.5±16.1	$p > 0.05$
Triglycerides	100.7±10.6	95.5±6.6	$p > 0.05$
HDL-C	58.0±14.1	62.7±10.1	$p > 0.05$
LDL-C	53.9±3.1	47.7±4.7	$p > 0.05$
VLDL-C	20.1±2.1	19.8±1.3	$p > 0.05$
AI	2.3±.1.8	2.1±1.6	$p > 0.05$
CRI	0.9±0.2	0.8±0.5	$p > 0.05$
Non-HDL-C	74.0±11.0	66.8±6.0	$p > 0.05$

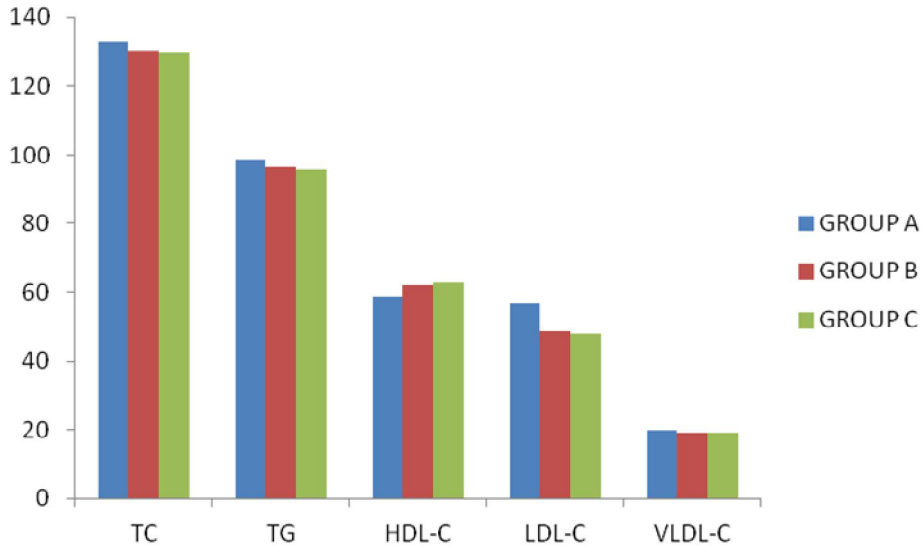

Figure 1: Serum total cholesterol, triglycerides, HDL-C, LDL-C, VLDL-C (mg/dl) of Groups A (100 mg/day), B (200 mg/day) and C (400 mg/day) subjects after stimulation with Vitamin E for 21 days

DISCUSSION

Mortality caused by infectious disease is reported to be declining in developing countries whereas death toll from chronic degenerative diseases toll stroke and myocardial infarction has been on the increase. Extensive evidence between plasma lipid and lipoprotein levels and these degenerative diseases has been well documented [8]. Vitamin E has been identified as an antioxidant whose function mainly resides in the protection against lipid peroxidation as well as prevention against colon, prostate and breast cancers, some cardiovascular diseases, including ischemia [9]. Based on the preventive properties of Vitamin E on various diseases, we investigated the possible effect of Vitamin E on lipid profile of apparently healthy Nigerians.

The results of our investigation confirm previous reports that apparently healthy Nigerians have significantly lower lipid profile than caucasians [5,8,10]. Although there was apparently a decrease in the level of lipid parameters, except HDL-C, but the decrease was not significant. This is in agreement with the work of Khajehdehi

[11] who study the effect of vitamins on lipid profile of patients on regular haemodialysis.

The Atherogenic index (AI) is the ratio of total cholesterol to HDL-C while Coronary Risk Index (CRI) is the ratio of LDL-C to HDL-C. These two lipid ratios are widely regarded as significant indices of risk for cardiovascular diseases [12]. The recommended value for both indices is ≤ 3.5, but in the present study, AI before and after vitamin E supplementation was 2.5 while the highest CRI was 1.1. Vitamin dose had no significant effect on the indices.

The goal is to keep the AI and CRI below 5.0 and the optimum value is 3.5. Thus, the subjects fell below the optimum range (0.5-3.5) for these indices as confirmed in an earlier report [5] which found that healthy Nigerians have lower serum lipid levels than caucasians. Also, non-HDL-C which is used as a surrogate marker of apolipoprotein B was observed to be low in the present study. There is strong evidence that non-HDL-C may be a better predictor of coronary heart disease (CHD) mortality and non-fatal coronary events than LDL-C [13]. The recommended target goal for non-HDL-C is < 130 mg/dl. The highest non-HDL-C obtained in this study is 80 mg/dl. Elevated non-HDL cholesterol signifies increased CVD risk, even if LDL cholesterol levels are at or below the National Cholesterol Education Program (NCEP) goal of less than 35 mg/dl or appear normal. In clinical trials, non-HDL cholesterol has been shown to independently predict cardiovascular diseases [14].

Our study also shows no significant difference in serum lipid pattern following oral administration of varying oral vitamin E. This is in accordance with the work of Clapkin *et al* [15] who found no significant differences following treatment with high doses of vitamin E in renal patients. The authors concluded that short–term high dose vitamin E ingestion is unlikely to benefit the majority of renal patients on maintenance haemodialysis with regard to their circulating levels of HDL-C.

CONCLUSION

Although there seems to be no significant effect of low and high doses of vitamin E oral administration on the lipid profile of the subjects studied, it should, however, be noted that the, effect can be amplified if vitamin E is co-administered with vitamin C. It is, therefore, recommended that further work should be carried out on co-administration of vitamins E and C to determine the health benefits of the combination to humans.

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