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Original Research Article

EFFECTS OF VITAMIN C AND E ON LIPID PROFILE AND KIDNEY PERFORMANCE OF ALBINO RATS

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Abstract: *The current study has been intended to estimate the belongings of vitamins E and C on lipid profile and renal performance of Albino rats. Vitamin E is a chain breaking lipid dissolvable cancer prevention agent that has been utilized in the therapy of cardiovascular illnesses, immunological and hematological issues and peripheral neuropathy. Vitamin C is enormous in imperative metabolic exercises including tryptophan digestion, iron retention, development of ferritin as cell cancer prevention agent, electron transport framework and coenzyme for cathepsin, liver esterases and omega-oxidation of unsaturated fats. Vitamin C and E are known to be powerful antioxidant, utilization of vitamin C and E indicated significantly lowered hypertension and improved insulin activity and decline lipid profile. Both vitamin C and vitamin E decreased lipid per oxidation. Experiment was conducted on Albino rats and treated with different doses of vitamins according to the protocol. Albino rats were divided into 4 groups, out of four group one group called the control group and other 3 groups were treated groups, treated group A was supplemented with vitamin C, treated group B was supplemented with vitamin E), treated group C was supplemented with both vitamins together and fourth group (Group D) called the control group this group was given free access to food and water throughout the experiment. After completion of experimental period, rats were sacrificed for the collection of blood and blood was taken in EDTA for the collection of serum. Serum was collected for the analysis of higher density lipoprotein test (HDL), low density lipoprotein (LDL), very low-density lipoproteins test (VLDL), total cholesterol test (TG), meanwhile Urea test, Uric acid test and Creatinine test were examined. Result showed that means values of initial body weight and final body weight were significantly ($p \leq 0.05$) different. Values of liver, kidney, Pancreas and Heart weight (g) of Albino rats were significantly ($p \leq 0.05$) different. Values of Urea, Uric acid and Creatinine of Albino rats were significantly ($p \leq 0.05$) different. Values of lipid profile of Albino rats were significantly ($p \leq 0.05$) different.*

Keywords: Vitamin, Albino Rats, higher density lipoprotein, low density lipoprotein, cholesterol

Introduction

Nutrients are synthetic substances that we as a whole need to remain healthy. In seven significant supplements, nutrients assume focal function in the body and engaged with the cycles of typical digestion, cell guideline, improvement and are fundamental for development (Kolesnikova *et al.*, 2015). A few nutrients (for example, nutrients A, C and E) are known to show a significant part in enhancing the harmfulness impacts of reactive species produced by chemical agents in organic frameworks. In the body cell reinforcements are normally present, for example, cancer prevention agent nutrients, are given as micronutrients in the eating regimen. Nutrients C and E are known to be powerful cancer prevention agents. Antioxidants are currently utilized as dietary enhancements in keeping up wellbeing and forestalling ailments, for example, malignant growth and coronary illness. Dietary antioxidants are substance that essentially diminishes the unsafe impacts and disturb ordinary physiological capacities at the cell level in animals and humans (Childs, 2000). The most fundamental water-solvent cell reinforcement in human serum is Vitamin C, the significant guard component, in the watery stage; against the destructive impact of free revolutionaries is the antioxidant vitamin C (Lakefield, 2005). In diet significant wellsprings of vitamin C comprise fundamentally of vegetables and natural products. These comprise of citrus organic products, orange, lemon, lime, pineapple and strawberry; vegetable

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sources incorporate cabbage, cauliflower, green peas, potatoes and tomatoes, with "Amla" as the most extravagant source (Eteng *et al.,* 2006).

Vitamin C (Vit C) assumes a significant function as a cancer prevention agent to ensure cells against free revolutionary delivered injury. By recovering the cancer prevention agent Vitamin (Vitamin C) has capacity to search free extremists and furthermore securing cell layer (Hattiwale *et al.,* 2013). Vitamin C impacts on vascular responsiveness and on Intestinal irons retention, decrease of destructive oxidants in the stomach. Vitamin C assumes a function in iron ingestion, vascular illness hypertension gastric and disease avoidance. Vitamin C can likewise shield and animate biosynthesis of endothelial nitric oxide (NO), which is significant for vascular unwinding. Vitamin C seems to effectively affect testicular capacities and erectile in sound and unfortunate subjects with conceptive issues (Kehinde *et al.,* 2018). Vitamin C improves the condition of diabetes mellitus in blend dealt with rodents by boundaries like serum glucose level, insulin level and HOMA-IR. This demonstration is presumably because of improving insulin affectability and recovery of β-cells (Helal *et al.,* 2013). Vitamin C (ascorbic corrosive) shields the cellular compartment from the water-dissolvable oxygen nitrogen revolutionaries that is a notable low-atomic weight cancer prevention agent (Kalender *et al.,* 2010). Vitamin C insufficiency causes traditional condition name as Scurvy. Its side effects of Scurvy identified with inadequate collagen blend which is demonstrated by hemorrhages and different subcutaneous, muscle shortcoming and delicate swollen gums free teeth (Padayatty *et al.,* 2003).

Vitamin E is fat solvent and its significant assignment in the body is cancer prevention agent that safeguards the body Vitamin E is basic cell reinforcement. Its utilization is accounted for to lessen the pervasiveness of cardiovascular malady. An eating routine high in nutrient E can't have an ideal outcome aside from on the off chance that it is moreover wealthy in sustenances that give these various enhancements. It was discovered that a helpful cooperation between vitamin C and vitamin E (vit C + vit E) is genuinely conceivable, while between nutrient C and beta-carotene is doubtfully and one might be available between vitamin E and beta-carotene (Glynn, 2007).

A portion of the food is wellsprings of vitamin E, which incorporate Alfalfa sproats, avocado, Carrot, chickweed, Cumfrey Root, Dadelion Root, garlic, greens (verdant), lemon grass, bog mallow and mushrooms. Food sources, for example, Grape organic product juice, Orange, Straw berries, Tomato, Sweet red pepper, Broccoli (Dede and Ngawuchi, 2003). Oral supplementation of Vitamin E at 400 mg/day for 9 months in hyperoxaluric and in hypertensive rodents could standardize dynamic and biochemical properties of Tamm-Horsfall protein which delayed down CaOx precious stone collection (Sumitra *et al.,* 2005). Vitamin E has a solid cell reinforcement limit and has been utilized in various ischemia-reperfusions. It assumes a preeminent function in keeping up cell layer unwavering quality by restricting lipid per oxidation by ROS (Canbaz, 2003). Antioxidant's agent impacts of nutrient E on rodent's kidney are upheld by the expanded degrees of renal nutrient E in the animals submitted to practice pressure and treated with nutrient E. Nutrient C and E treatment offered beneficial outcomes on the kidney of developing pigs (Jena and Chainy, 2011). In the kidney with respect to the effectiveness and wellbeing of vitamin E are essential to quality the significance of vitamin E as an enhancement to substantial dynamic individuals (Hillstrom *et al.,* 2003). Vitamin E and ascorbic acid are intense cell reinforcements that are known to keep LDL from oxidation. The adequacy of cancer prevention agent nutrients, either alone or in mix on boundaries of lipid oxidative caused harm in hemodialysis patients (Deyhim *et al.,* 2007). The body weight reduction secured by the limit of Vitamin E and could be credited to its capacity to decrease hyperglycemia (Postic *et al.,* 2004). Nutrient E have eight typically well-known structures; that is, the alpha, beta, gamma and delta classes of tocopherol and tocotrienol, which are built by plants from homogentisic corrosive. Alpha-and gamma-tocopherols are the two essential sorts of the supplement, with the all-out degrees of these depending upon the reason. Close by the tocopherols, the alpha-and gamma-tocopherols are started in the serum and the red platelets, with alpha-tocopherol present in the most extraordinary core interest. Beta- and delta-tocopherols are making in the plasma in tiny obsessions (Zingg, 2007).

Materials and methods

Study site

The preset study was carried out in the CRIMM animal house as well as the research laboratory of The University of Lahore. Twenty grown-up Albino Rats with no regard to sex, 12 weeks old, weighing 150–250 g were purchased from the animal house of The University of Lahore and housed in stainless steel mesh cages under control conditions with free access to food and water. Albino rats were divided into four groups, out of four one group called control and other three groups were

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treated groups, treated group A supplemented with vitamin C, treated group B supplemented with vitamin
E, treated group C supplemented with both vitamins together E+C, and fourth group called control group, no supplements was given to this group and kept on normal diet. After every week weight of the rats was estimated and furthermore kept up the expansion of food after consistently food was expanded concerning increment in weight. All rats were maintained under specific pathogen-free conditions in the animal house.

Dose preparation and administration

Vitamin E (α-tocopherol acetate) and Vitamin C (ascorbic acid) was purchased from standard commercial suppliers. Normal feed of rats was firstly grind into crushed form and assorted with vitamin E capsule at the rate of 200 mg /body weight. Small tablets were made and given to the rats daily according to their body weight. Suspension was made in 1ml of distilled water and introduced into animal body by oral gavages, delivering the dose directly into the stomach, although carefully entered the gavage to ensure that it does not enter the trachea or damage the esophagus or stomach. Tablets of vitamin C were crushed and dissolved in pure water for daily drinking purpose. Vitamin E was supplemented at the rate of 200 mg /body weight and Vitamin C induced at the rate of 1.0 g/kg. Each tablet (250 mg) of vitamin C was crushed and dissolved in 2 mL of distilled water to obtain 50 mg/mL suspension. The suitable dosages of the supplements were introduced vocally to all experimental animals according to their body weight on day after day for 7 weeks. During the experimental period, on every week weight of treated and non-treated rats were measured, noted and dose was altered according to the weight of rats.

Dissection and sample collection

At the end of experiment period the animals were kept fasting for the night and anesthetized by utilizing chloroform. Rats were checked for unconsciousness and put the rats on dissecting board for dissection. Blood sample was collected with the help of disposable syringe in 5ml EDTA tubes and kept at room temperature. The collected blood was centrifuged at 1,000–2,000 rpm for 10 minutes in a centrifuge machine. The samples were maintained at 2–8°C during treatment and were stored at –20°C or lower for further biochemical tests. Samples were collected to know the effect of vitamins on animal's lipid profile and renal performance.

Biochemical test

Collected serum was brought to diagnostic laboratory for biochemical tests like higher density lipoprotein test (HDL), low density lipoprotein (LDL), Total Lipids test (TL), and very low-density lipoproteins test (VLDL). To know the effect of vitamin E and C on renal performance Urea test, Uric acid test and Creatinine test were examined.

Results

The current study was planned to estimate the efficacy of vitamins C & E on the various physiological and biochemical factors in male albino rats. After performing data analysis, following observations were recorded.

Body weight (g)

In current study, significant variations in initial body weight and non-significant variations in final body weight were observed. The initial body weight of groups A, B, C and D was 221.66 ± 14.81, 200.0 ± 5.77, 266.33 ± 0.88 and 257.0 ± 13.52 respectively, whereas the final body weight was 267.33 ± 15.19, 237.66 ± 12.41, 261.0 ± 4.58, 260.66 ± 12.12 (Table 1). The results showed that final body weight of the rats of group A and group C increased as compared to control group (Table 1).

Table-1: Mean ± SEM value of body weight (g) of albino rats fed with basal diet and basal diet supplemented with Vitamins C & E.

Parameters	Feeding groups				
	Vitamin C	Vitamin A	Vitamin C + Vitamin A	Control	P. Value
IBW	221.66 ± 14.81[b]	200.00 ± 5.77[b]	266.33 ± 0.88[a]	257.00± 13.52[a]	0.0066
FBW	267.33 ± 15.19	237.66 ± 12.41	261.00 ± 4.58	260.66 ± 12.12	0.3610

Mean ± SEM values within rows with different alphabets are significantly ($p \leq 0.05$) different. **IBW:** Initial body weight, **FBW:** Final body weight

Organ's weight (g)

In current study it was perceived the non-significant change in weight of liver, kidney, pancreas, and heart surrounded by the experimental groups. The weight of liver of groups A, B, C and D was 9.82 ± 0.42, 9.40 ± 0.30, 8.52 ± 0.50 and 8.93 ± 0.29 respectively. Similarly, the weight of kidney was 2.10 ± 0.10, 1.86 ± 0.58, 1.86 ± 0.09, and 2.13 ± 0.23, whereas the weight of pancreas was 0.48 ± 0.03, 0.50 ± 0.05, 0.56 ± 0.04 and 0.53 ± 0.03. The

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weight of heart was 0.86 ± 0.05, 0.80 ± 0, 0.78 ± 0.02 and 0.80 ± 0.05. The results show that weight of liver of group A and group B was increased as compared to control group, while weight of group C was reduced. The weight of kidney of feeding groups was lower than control group. The weight of pancreas of group C was higher and group A and group B was lower than control group. The result shows that weight of heart of group A was higher than control group whereas the weight of group C was lower than control group. The heart weight of Group B was like control group (Table 2).

Table-2: Mean ± SEM values *of Liver, Kidney, Pancreas* and *Heart weight* (g) of albino rats fed with basal diet and basal diet supplemented with Vitamins C & E.

Parameters	Feeding groups				
	Vitamin C	Vitamin E	Vitamin C + Vitamin A	Control	P. Value
Liver	9.82 ± 0.42	9.40 ± 0.30	8.52 ± 0.50	8.93 ± 0.29	0.1893
Kidney	2.10 ± 0.10	1.86 ± 0.58	1.86 ± 0.09	2.13 ± 0.23	0.7797
Pancreas	0.48 ± 0.03	0.50 ± 0.05	0.56 ± 0.04	0.53 ± 0.03	0.5088
Heart	0.86 ± 0.05	0.80 ± 0.00	0.78 ± 0.02	0.80 ± 0.05	0.4811

Mean ± SEM values within rows with different alphabets are significantly ($p \leq 0.05$) difference.

Renal performance

According to analysis of renal parameters of experimental groups, it was observed that serum concentration of uric acid (mg/dL) varied significantly whereas concentration of urea (mg/dL), creatinine (mg/dL) varied non-significantly. The concentration of uric acid (mg/dL) in groups A, B, C and D was 2.46 ± 0.31, 3.23 ± 0.43, 5.36 ± 0.38, 2.70 ± 0.26 respectively. The concentration of urea in groups A, B, C and D was 62.66 ± 6.69, 63.66 ± 0.88, 63.33 ± 3.84, 65.33 ± 6.06 respectively. The creatinine level (mg/dL) of the groups A, B, C and D was 0.56 ± 0.06, 0.63 ± 0.03, 0.73 ± 0.03 and 0.63 ± 0.06 (table 4.3).

Table-3: Mean ± SEM values of urea, uric acid and Creatinine of albino rats fed with basal diet and basal diet supplemented with Vitamins C & E.

Parameters	Feeding groups				
	Vitamin C	Vitamin E	Vitamin C + Vitamin E	Control	P. Value
Uric acid	2.46 ± 0.31^{b}	3.23 ± 0.43^{b}	5.36 ± 0.38^{a}	2.70 ± 0.26^{b}	0.0016
Urea	62.66 ± 6.69	63.66 ± 0.88	63.33 ± 3.84	65.33 ± 6.06	0.9828
Creatinine	0.56 ± 0.06	0.63 ± 0.03	0.73 ± 0.03	0.63 ± 0.06	0.2437

Mean ± SEM values within rows with different alphabets are significantly ($p \leq 0.05$) different.

Lipid profile

According to present study analysis, the concentration level of lipid profile varies significantly ($P \leq 0.05$). The cholesterol (mg/dL) level of group A, B, C and D after the experiment was 67.66 ± 2.96, 69.33 ± 0.66, 83.66 ± 9.90 and 68.00 ± 3.05 respectively. The concentration of triglyceride (mg/dL) of group A, B, C and D after the experiment was 85.33 ± 11.66, 53.33 ± 6.17, 67.33 ± 3.71 and 80.00 ± 16.19, whereas the HDL concentration was 17.00 ± 1.52, 16.33 ± 1.76, 19.00 ± 2.51 and 17.33 ± 1.66 and the concentration of LDL was 48.33 ± 7.21, 25.66 ± 4.70, 31.66 ± 4.17 and 43.66 ± 11.46. The VLDL concentration was 19.00 ± 2.08, 12.33 ± 0.66, 16.00 ± 1.52 and 18.33 ± 2.72. The TL concentration was 363.33 ± 6.43, 327.0 ± 12.74, 367.66 ± 15.81 and 353.33 ± 14.99 (Table 4).

Table-4: Mean ± SEM values *of lipid profile* of albino rats fed with basal diet and basal diet supplemented with Vitamins C & E.

Parameters	Feeding groups				
	Vitamin C	Vitamin E	Vitamin C + Vitamin A	Control	P. Value
TRIG	85.33 ± 11.66	53.33 ± 6.17	67.33 ± 3.71	80.00 ± 16.19	0.2234
CHOL	67.66 ± 2.96	69.33 ± 0.66	83.66 ± 9.90	68.00 ± 3.05	0.1879
HDL	17.00 ± 1.52	16.33 ± 1.76	19.00 ± 2.51	17.33 ± 1.66	0.7880
LDL	48.33 ± 7.21	25.66 ± 4.70	31.66 ± 4.17	43.66 ± 11.46	0.1974

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VLDL	19.00 ± 2.08[a]	12.33 ± 0.66[b]	16.00 ± 1.52[ab]	18.33 ± 2.72[ab]	0.1343
TL	363.33 ± 6.43	327.0 ± 12.74	367.66 ± 15.81	353.33 ± 14.99	0.1986

Mean ± SEM values within rows with diverse alphabets are significantly (p≤0.05) different. **TRIGL**: Triglycerides; **CHOL**: Cholesterol, **HDL**: High-density lipoproteins, **LDL**: Low-density lipoproteins, **VLDL**: Very low-density lipoproteins; TL: Total Lipids

Discussion

The present study was planned to estimate the effects of vitamins E, vitamin C and combined effect of E and C on lipid profile and renal performance of Albino Rats. The outcome demonstrated that there was a significant (P<0.05) decline in CHOL and HDL, and non-significant (p>0.05) expanded in TRIG, VLDL, TL and LDL as appeared in (Table 4). A conceivable clarification for the observed impact on serum lipids might be because of the activation of the chemical 7 α–hydroxylase by vitamin C which upgrades the transformation of plasma cholesterol into bile acid subsequently. Vitamin C, bringing about a reduction in serum levels of cholesterol. Current outcomes demonstrated that vitamin C and E treated groups indicated a non-significant (p>0.05) decline in the degree of LDL - cholesterol and TG when contrasted with the control. Current outcomes upheld with the investigation of Franke (2018) who detailed that the co-treatment with vitamin C didn't impact the lipid profile (p>0.05). While vitamin C brought down the serum glucose. It is conceivable to be viewed as favorable combination of vitamins since independently they produce advantageous impacts. The present result agree with previous reports as documented by Li *et al* (2010) who suggested that decreases in LDL and TG concentrations were more significant with vitamin E supplementation. Vitamin E addition may decrease the sensitivities of several oils to oxidation. Mineral supplementations have been appeared to effectively effect on lipid profile. Vitamin C and E treated groups demonstrated a non-significant (p>0.05) decline in the degree of cholesterol when contrasted with the control as revealed by the mean values for group A, B and C (208.8±7.33, 225.2±6.42 and 250.4 ± 7.83) and the decrease was dose dependent with group A showing more prominence. TG and (LDL-CHOL) levels of the group A and B were diminished, however not significantly (p>0.05) as revealed by their mean values when contrasted with the control (168.6±4.22, 180.6±4.22, and 242.6±7.27) and (131.6±6.58, 151±5.01, and 171.9±6.6) separately. This is basically because of the antioxidative possibilities of the vitamins and the synergistic impact of their co - organization. From current outcomes, vitamin E treated group demonstrated a non-significantly (p>0.05) decline in the degree of TG, CHO, VLDL, TL and LDL - cholesterol when contrasted with the control and HDL remain practically same. Eteng *et al* (2006) additionally upheld the current examinations who announced that vitamins altogether (P < 0.05) decreased TC, LDL, VLDL and HDL. Association of vitamin C created a significant (P<0.05) decline in (TC), (VLDL) and (LDL) in the experimental groups there was no adjustment in (TG) and (HDL) levels.

According to analysis of renal parameters of experimental groups, it was observed that serum concentration of uric acid (mg/dl) varied significantly whereas concentration of urea (mg/dL), creatinine (mg/dL) varied non-significantly as shown in table 3. Recent study is in agreement with previous experiments as documented by Kedziora-Kornatowska et *al.*, (2003) who stated that both vitamin C and vitamin E diminished lipid per-oxidation and increased the activities of cell reinforcement proteins in the kidneys of rodents just as decreased UAE, diminished kidney weight and GBM thickness. Vitamin E supplementation improved non-enzymatic cancer prevention agent movement in young rodents. Vitamins supplemented group shows non-significantly lessening in serum cholesterol levels, huge decline in serum LDL-C levels, But there was an inconsequential contrast in serum levels of TG, HDL-C and VLDL-C (p>0.05). Vitamin C diminishes cholesterol and LDL-C and improves lipid profiles. Yet, have no significant impact on VLDL-C, HDL-C and fatty substances. Vitamin E co-enhanced didn't influence HDL-cholesterol levels. In current study it was perceived that non-significant change in weight of liver, kidney, pancreas and heart among the experimental groups (Table 2). Current outcomes of effects of vitamins on kidneys compared with the normal group and results were agreed by different scientist stated that neither vitamin E, vitamin C, nor the blend affected the urinary discharge pace of 7-hydro-8-oxo-29-deoxyguanosine or the antioxidative limit of plasma. Vitamin E and vitamin E+C upgraded the oxidation opposition of confined lipoproteins and complete serum lipids.

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