

The relation of (vitamin C) supplementation to cholesterol and triglyceride levels in sera of apparently healthy individuals

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Abstract

This study was performed to examine the relationship between ascorbic acid (vitamin C) supplementation to cholesterol and triglyceride levels in sera of apparently healthy individuals before and after supplementation with vitamin C in sera of (40) healthy volunteers subject (21male &19 female) were divided to four groups A ,A',B,B' refer to male volunteers before supplementation ,male volunteers after supplementation , female volunteers before supplementation and female volunteers after supplementation with vitamin C respectively .

Asignificant decrease cholesterol and triglyceride in sera of all studied group after supplementation with vitamin C ,compared to the before supplementation were found .

This study showed the relation between serum ascorbic level and reduction in serum cholesterol and triglyceride level

Introduction

Lipids have the common property of being relatively insoluble in water (hydrophobic) but soluble in non-polar solvents. Amphipathic lipids also contain one or more polar groups, making them suitable as constituents of membranes at lipid: water interfaces (1)

Cholesterol, an amphipathic lipid is an important component of membranes it is the parent molecule from which all other steroids in the body, including major hormones such as the adrenocortical and sex hormones, D vitamins and bile acids, are synthesized (2)

All of the steroid, is a derivative of the tetracyclic hydrocarbon perhydrocyclopentano phenanthrene (3)

Cholesterol is synthesized in many tissues from acetyl CoA and is the precursor of all other steroids in the body, most cholesterol molecules are synthesized in the liver, the average level cholesterol from man and woman is limited within (150 –250) mg /dl (4)

Cholesterol is typically a product of metabolism of animals and therefore occurs in foods of animals origin such as egg yolk, meat, liver, and brain (5)

Cholesterol is widely distributed in all cells of the body but particularly in nervous tissue .it a major constituent of the plasma membrane and of plasma lipoproteins, about two Thirds of plasma cholesterol is esterified with fatty acids to form cholesterylester, where the hydroxyl group on position 3 is esterified with along chain fatty acid (6)

The triacylglycerol are esters of the trihydric alcohol glycerol and fatty acids. Mono –and di –acylglycerols where in one or two fatty acid are esterified with glycerol are also found in the tissues these are of particular significance and they are synthesized from acyl –CoA and glycerol –3-phosphate (7) (8)

Triacylglycerol is the main storage lipid in adipose tissue. Upon mobilization, free fatty acids and glycerol are released. free fatty acids are an important fuel source (1)

Triacylglycerol undergoes lipolysis (hydrolysis) and re esterification. These two processes are entirely different pathways involving different reactant and enzymes.

This allows the processes of esterification or lipolysis to be regulated separately by many nutritional, metabolic, and hormonal factor (9)

Vitamin C (ascorbic acid) is the water-soluble vitamin and function as Coenzyme (10)

Vitamin C is an essential nutrient that is involved in a number of cellular process (11)

However, unlike most mammals, man is unable to synthesize vitamin C and it must therefore be required from the diet (12)

Ascorbic acid has specific roles in the copper- containing hydroxylases and the α -ketoglutarate –linked iron – containing hydrolyses. It also increases the activity of a number of other enzymes in vitro, though this is a non – specific reducing action (13)

Ascorbic acid is one of the best reducing physiological substance, because of its water solubility and its ability to reform α -tocopherol by reducing-tocopherol from membranes surface (14)

The aim of this study is to investigate the effect of ascorbic acid (vitamin C) supplementation orally to apparently healthy middle age individuals on their cholesterol and triacylglycerols levels.

Subjects volunteers

Forty apparently healthy subjects (21 male and 19 females) ranging from 20 – 40 years in age were included in this subject they were chosen from Al-Kindy teaching Hospital, Baghdad.

All were evaluated by full clinical history, complete physical examination .non of them had clinical or laboratory evidence of a disease that may affect the parameters to be measured and had negative drug history .pregnancy ,female on contraceptive pills , Patient suffered from any illness were exclusion criteria

Blood samples

Five ml of venous blood was aspirated using disposable needles and syringes. Samples were collected between 9:00 A.m.- 2: 00 P.m., after 12 hours fast .the blood was allowed to clot in plain tube for 30 minutes at room temperature and the serum was recovered by centrifugation at 3000 rpm this serum was kept at (4 c8) for maximum of (72 hours) .

Experimental

Determination of total cholesterol (Ch) in serum

Total cholesterol in the serum was determined by enzymatic method according to Allain ,et.al (15).

Determination of triacylglycerol (TG) in serum

Triacylglycerol in the serum was determined by enzymatic method according to Fossati & prencipe (16).

Ascorbic acid (vitamin C) Supplementation

Vitamin C supplementation 500 mg one daily was given for 30 days. After supplementation cholesterol (Ch) and triacylglycerol for volunteers were obtain and determined by the same enzymatic method (15) (16).

Statistical analysis

Data presented as the means \pm standard deviations. student-t-test was used

to compare the significance of the difference in the mean values of any two groups, ($P < 0.05$) was considered statistically significant

The overall predictive values for the results in all studied groups were performed according to program of office XP 2002

Result and Discussion

Table and figure (1) showed a significant decreased in serum level of (Ch) for male and female ,after supplementation with vitamin C compared before supplementation with p value < 0.05 it was (210.33 \pm 37.03), (192.89 \pm 34.37)mg /dL before supplementation for male and female respectively , while it reduced to (184.05 \pm 31.65) , (170.53 \pm 29.15) after supplementation for male and female respectively .

Vitamin C is water –soluble antioxidant in human plasma ,it is generally agreed that a diet rich in fruits and vegetables ,containing various micronutrients (such as vitamin C) which are important for prevention of several degenerative disease and contribute to the maintenance for health (17)

The supplementation of vitamin C which considered to be one of the most powerful ,least toxic natural antioxidant and reduce cholesterol levels significantly (18) (19) .

Some observational studies have found significant negative correlation between ascorbic acid status and total serum cholesterol (20) (21) .

The reduction in cholesterol level after vitamin C supplementation could be explained by the fact that ascorbic acid increase the rate of catabolism of cholesterol to acids (22) (23) (24).

Ascorbic acid is an important factor in cholesterol homostasis (25) .

A number of studies have reported that ascorbic acid administration lowers blood cholesterol levels in the laboratory animals which lacks the enzyme required for the hepatic synthesis of ascorbic acid (26),(27),(28)

Experiments performed on guinea pig have shown that ascorbic acid is necessary for the rate –limiting step in the conversion of cholesterol to bile acids (29) ,(30) ,(31) .

Other animal studies have reported that ascorbic acid administration attenuates the expected rise in serum cholesterol after cholesterol –feeding (32),(33),(34).

Table (2) and figure (2) showed a significant decrease in TG level in sera of both groups after supplementation with vitamin C compared to that before supplementation with p value < 0.05 .

This results in agreement with (35) and agree with (36),(37),(38),(39), which showed that the average of TG in male is greater than in female and these for physiological reason .

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**Table (1): cholesterol level in sera of all studied groups
Before and after supplementation with (Vit C)**

Groups	NO	Serum cholesterol (mg/dl)	p
A	21	210.33 ± 37.03 (132-287)	P< 0.05
A'	21	184.05± 31.65 (130-270)	
B	19	192.89± 34.37 (140-270)	P< 0.05
B'	19	170.53 ± 29.15 (130-250)	

**Table (2): triglyceride level in sera of all studied groups
Before and after supplementation with (Vit C)**

Groups	NO	Serum triglyceride (mg /dl)	p
A	21	154.52 ± 59.49 (80-285)	P< 0.05
A'	21	122.52± 50.30 (55-265)	
B	19	132.58 ± 40.25 (80-245)	P< 0.05
B'	19	100.05 ± 28.55 (57-157)	

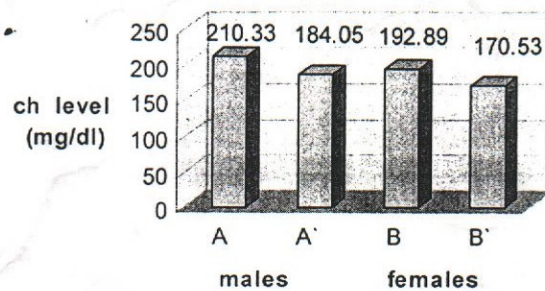


Figure (1): cholesterol level in sera of all studied groups
Before and after supplementation with (Vit C)

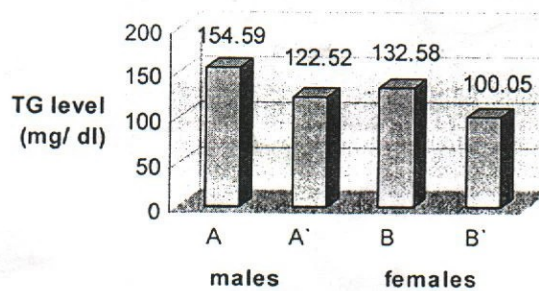


Figure (2): triglyceride level in sera of all studied groups
Before and after supplementation with (Vit C)

العلاقة بين الدعم (بفيتامين ج) ومستوى الكوليسترول والكليسريد الثلاثي في مصل دم أفراد أصحاء ظاهرياً

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الخلاصة

أنجزت هذه الدراسة لاختبار العلاقة بين الدعم بحامض الاسكوريك (فيتامين ج) ومستوى الكوليسترول والكليسريد الثلاثي في مصل دم أفراد من الأصحاء ظاهرياً قبل وبعد الدعم بفيتامين ج

أستخدم مصل دم (40) شخصاً من الأصحاء (21 ذكراً و 19 أنثى) قسمت على أربع مجاميع A, A', B, B' تعود إلى متطوعين ذكور قبل الدعم ،متطوعين ذكور بعد الدعم ، متطوعين إناث قبل الدعم ، متطوعين إناث بعد الدعم على التوالي .

لقد وجد انخفاضاً معنوياً في الكوليسترول والكليسريد الثلاثي في مصل دم كل المجموعات المدروسة بعد الدعم بفيتامين ج بالمقارنة مع مستواها قبل الدعم .

أظهرت هذه الدراسة العلاقة بين مستوى حامض الاسكوريك المعطى والانخفاض الحاصل في مستوى الكوليسترول والكليسريد الثلاثي .