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## Study the effect of juice of two variety of pomegranate on decreasing plasma LDL cholesterol

Eghdamikoorkabijari Anoosh<sup>a</sup>\*, Eizadi Mojtaba<sup>a</sup>, Sadeghy Fatemeh<sup>a</sup>

<sup>a</sup>Islamic Azad University, Saveh Branch, Iran

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### Abstract

Pomegranate juice (PJ) was indeed shown recently to possess impressive antioxidative properties. The purpose of this study was to determine the effect of pomegranate juice on plasma LDL cholesterol decreasing in hypercholesterolemia patients. In this investigation, patients were divided into three groups with twenty patients for each group. The treatments were including: 1-using Tabrizi variety of pomegranate juice 2- black variety of pomegranate juice 3- drug (lovstatin). The levels of blood LDL cholesterol in different experiments, before and after consumption of treatments were achieved respectively:

1- LDL: [b (150/50±10/758), a (130/92 ±10/758)],

LDL: [b (138/33±13/64), a (111/58±13/30)] 3- [b (158/25±10/759), a (130/50±10/758)] and LDL: 2- Respectively. Results were analyzed by compare means statistic test. The data indicated that LDL analysis of results were revealed that patients' LDL cholesterol in three groups, after consumption showed a significant decrease at  $p < 0.01$ . The consumption of group one and two were compared with group three, there was no difference between group one and two with group three. As with the drug, the two groups were effective on LDL cholesterol decreasing.

*Keyword:* Pomegranate juice, LDL cholesterol, antioxidant, cardiovascular disease.

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### 1. Introduction

Oxidative stress, a major contributor to cardiovascular diseases, is associated with lipid peroxidation in arterial macrophages and in lipoproteins. Oxidized low density lipoprotein (Ox-LDL) has been shown to be atherogenic and inhibition of LDL oxidation by potent dietary flavonoid antioxidants [4, 5] attenuated atherosclerosis developments in laboratory animal. Pomegranate juice (PJ) was indeed shown recently to possess impressive antioxidant properties due to its polyphenolic, tannins and Anthocyanins, etc. LDL oxidation is a key factor in the formation of plaque in the arteries, also called atherosclerosis. One of the best ways to defend against the damaging oxidants (1).

Effects of free radicals are to consume foods and beverages that are rich in antioxidants to animals was shown to be associated with inhibition of LDL oxidation and macrophage foam cell formation, and attenuation of atherosclerosis development. Esmailzadeh reported after consumption of concentrated pomegranate juice significant reductions were seen in total cholesterol ( $p < 0.006$ ), low-density lipoprotein-cholesterol (LDL-c) ( $p <$

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\* Eghdamikoorkabijari Anoosh. Tel.: +989122550063.

E-mail address: [eghdami\\_a@yahoo.com](mailto:eghdami_a@yahoo.com)

0.006), LDL-c/high-density lipoprotein-cholesterol (HDL-c) ( $p < 0.001$ ), and total cholesterol/HDL-c ( $p < 0.001$ ). However there were no significant changes in serum triacylglycerol and HDL-c concentrations(2). Furham et al (2005) reported Pomegranate juice inhibits oxidized LDL uptake and cholesterol biosynthesis in macrophage. Pomegranate juice (PJ) was shown to inhibit macrophage foam cell formation and development of atherosclerotic lesions(3). Rosenblat investigated the effects of pomegranate juice (PJ; which contains sugars and potent antioxidants) consumption by diabetic patients on blood diabetic parameters, and on oxidative stress in their serum and macrophages. He observed increased level of cellular peroxides (by 36%), and decreased glutathione content (by 64%). PJ consumption significantly reduced cellular peroxides (by 71%), and increased glutathione levels (by 141%) in the patients (4). Aviram et al (2004) investigated effect of Pomegranate juice consumption for 3 years on patients with carotid artery stenosis and reduces common carotid intima-media thickness, blood pressure and LDL oxidation. Dietary supplementation with polyphenolic antioxidants to animals was shown to be associated with inhibition of LDL oxidation and macrophage foam cell formation, and attenuation of atherosclerosis development (5). We investigated the effects of pomegranate juice (PJ, which contains potent tannins and anthocyanins, pj) consumption by atherosclerotic patients with carotid artery stenosis (CAS) on the progression of carotid lesions and changes in oxidative stress and blood pressure. Therefore, the aim of our study is to estimate the effect of two variety pomegranate juice consumption for four weeks by hypercholesterolemia patients and comparing the blood levels of LDL cholesterol in patients before and after PJ consumption.

## 2. Methods: subjects and

In this investigation, patients were divided in three groups with twenty patients for each group. The treatments were including: 1-using Tabrizi variety of pomegranate juice 2- black variety of pomegranate juice 3- drug (levustatine). The levels of blood LDL.C in different experiments, before and after consumption of treatments were measured. We used venous blood sampling for fasting blood LDL cholesterol. These samples were collected before and after consumption treatment. Serum was separated by centrifugation (10 minute, 1500 rpm). Serum LDL cholesterol levels were measured with the use of enzymatic LDL kit (Zist Shimi) by a unic spectrophotometer. Results of each treatment were inserted in three tables with two columns, before and after treatment consumption. Fresh PJ (black and Tabrizi variety, Saveh) was used in this study. Pomegranates were hand-picked, washed, chilled to 4°C. The fruit was then crushed, squeezed. The PJ was filtered, and stored at -20°C until use (only 1-2 day). Administration of levustatine (cholesterol lowering drug by enzyme inhibition) to another group.

## 3. Results

Administration of (black and Tabrizi) PJ to two groups (12 patients in each group) 200 ml/day for 4 weeks, had significant effect on the plasma lipid, including total cholesterol and LDL-cholesterol (figure 1). LDL cholesterol of two groups were measured before and after consumption of treatments. Means of before and after were compared in each group. Black and Tabrizi pomegranate juice consumption decreased LDL cholesterol ( $P < 0.001$ ). On statistical analysis, serum LDL after PJ consumption by patients was comparatively lesser than before PJ using (figure 1). Administration of levustatine (cholesterol lowering drug by enzyme inhibition) to another group, had significant effect on serum LDL cholesterol.

The levels of blood total cholesterol and LDL.c in different experiments, before and after consumption of treatments were achieved:

Tabrizi PJ: LDL (mg/dl): [b (150/50±10/758), a (130/92±10/758)] Ch: [b (263/58±10/756), a (225/83±10/757)]

Black PJ: LDL (mg/dl): [b (158/25±10/759), a (130/50±10/758)] Ch: [b (274/00±10/759), a (243/75±10/759)]

Levustatine:

LDL(mg/dl):[b(138/33±13/64),a(111/58±13/30)]Ch:[b(265/25±10/758),a(208/42±10/759)]

Results were analyzed by compare means statistic test. The data indicated that LDL analysis of results were revealed that patients' LDL.C in three groups, after consumption showed a significant decrease at  $p < 0.01$ . The consumption of group one and two were compared with group three, there was no difference between group one and two with group three. As with the drug, the two groups were effective on LDL.C decreasing.

Table 1: comparing means of LDLcholesterol of plasma before and after consumption of treatments And their mean difference with lovstatin

	before consumption mean of LDL.c(mg/dl)	After consumption mean of LDL.c(mg/dl)	Mean difference	before consumption mean of ch(mg/dl)	After consumption mean of ch(mg/dl)	Mean difference
Black pj	158.25	130.5	-12.75	274	243.75	-30.25
Tab variety pj	150.5	130.92	-19.583	263.58	225.83	-37.75
drug	138.33	111.58	-26.75	265.25	208.42	-56.83

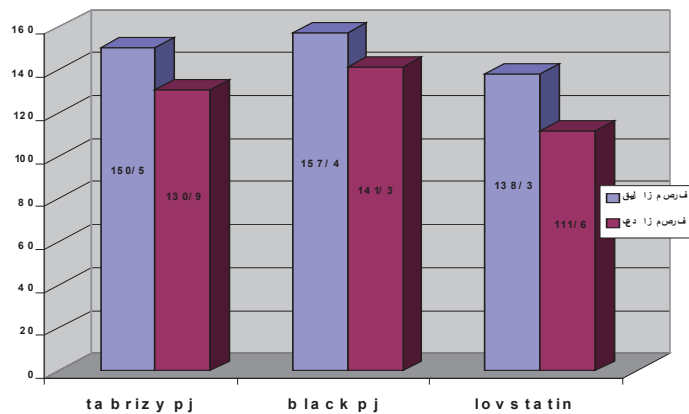


Figure 1: comparing means of LDLcholesterol of plasma before and after consumption of treatments

#### 4. Discussion

Atherosclerosis is a multi-factorial disease associated with different risk factors. Hypercholesterolemia is a major risk factor for atherosclerosis (6, 7), and reduction in plasma cholesterol concentration by drug therapy has reduced cardiovascular incidence (8). Consumption of natural nutrients, capable of reducing plasma cholesterol, thus, should also reduce development of atherosclerosis. Our study demonstrated that dietary consumption of pomegranate juice by patients with Hypercholesterolemia significantly reduced the levels of plasma cholesterol and LDLcholesterol. The LDLcholesterol lowering effect of pomegranate juice could have possibly resulted, at least in part, from its antioxidant effects. The anti-atherogenic of pomegranate juice could also be attributed to its direct antioxidant effects on macrophages as well as on plasma LDL. Arterial wall macrophages play a major role during early atherogenesis. Oxidative stress induces macrophage responses such as increased capacity to oxidize LDL, increased Ox-LDL cellular uptake, as well as macrophage lipid peroxidation (9). These lipids-per oxidized cells were shown to oxidize LDL even in the absence of transition metal ions, and this process depends on the oxidative state of the LDL and that of the macrophage (10). Pomegranate juice was shown in this study to decrease plasma LDL cholesterol. The LDL oxidation hypothesis of atherosclerosis development suggests that inhibition of LDL oxidation should result in the attenuation of the development of atherosclerotic lesions. We have demonstrated indeed that the reduced development of atherosclerotic lesions in patients that consumed pomegranate juice was

associated with reduced LDL oxidative state. This may be related to the fact that pomegranate juice can act as a free radical scavenger.

We conclude that consumption of pomegranate juice may be proven beneficial in attenuation of atherosclerosis development, since it is associated with reduced oxidation of LDL, reduced uptake of oxidized LDL by macrophages, reduced oxidative state of LDL and reduced LDL aggregation. All these effects lead to a reduced cellular cholesterol accumulation and foam cell formation, the hallmark of early atherosclerosis. Investigations of aviram, furham, esmailzadeh and Rosenblatt compatible with our study.

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