Lowering Effects of Lemon and Fresh Garlic Liquid Mixture on serum lipids level in Hypercholesterolemic Women

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Abstract

Background . Growing evidence suggests that diet rich in bioactive compounds proven to have a general protective effects on health and especially on cancer and cardiovascular diseases prevention. Lemon and garlic are among these compounds and health claims regarding lipids lowering benefits of them are widespread. In the present work the lowering effects of lemon and fresh garlic liquid mixture on serum lipids level were studied .

Material &Methods . A total of n=45 mild hypercholesterolemic women (cholesterol level>230mg/dL) was assessed. Based on the filed questionnaires n=15 were excluded and the rest randomized into 2 groups; treatment & control . Subjects were intervened to use either 150mL of the lemon and fresh garlic liquid mixture or water after lunch for a total period of 8 weeks. Measurements of fasting levels of cholesterol, low density lipoprotein, high density lipoprotein , and triglycerides were made at baseline and 8 weeks after.

Results. A 7.7% reduction in total cholesterol , 10.7% in LDL , and 11.7% in triglycerides in treatment group were obtained (paired T test p=0.001) . HDL levels remained unchanged in both groups (treatment & control).

Conclusions. It is concluded that use of this combined mixture attributes to dietary supplementation to lower serum lipids level in mild hypercholesterolemic women and may provide benefits on reducing cardiovascular diseases risk factors in this population .To further clarify the lowering effects of this mixture in specific groups including hypercholesterolemic men and women studies with large sample size are needed .

Key words. *Total Cholesterol, Low Density Lipoprotein, High Density Lipoprotein, Triglycerides, Organosulfur, and Flavonoids.*

1. Introduction

Atherosclerosis and cardiovascular disease (CVD) are the major causes of increasing death rate in both developed and developing countries and many risk factors associated with their occurrence (Deaton C et al., 2011) . High levels of blood total cholesterol, low density lipoprotein cholesterol (LDL), triglycerides(TG), and low level of high density lipoprotein cholesterol (HDL) are among the important risk factors. Guidelines to maintain quality of life for people with CVD have focused on decreasing lipids profiles including total and LDL cholesterol level as well as weight control and healthy nutrients use(Deaton C et al., 2011;NCEP final report .,2001) .

As a healthier foods lemon and garlic are important sources of many different nutrients that are used either raw or cooked. Researchers have reported that citrus fruits intake such as lemon have protective effect against CVD by lowering blood cholesterol level and perhaps by treatment of hyperlipidemia (Siasos G et al., 2013; Benavente Garcia O Castillo J, 2008). In addition, garlic has been used medicinally for centuries and still included in the traditional medicine of different cultures. Garlic oil and garlic consumption have been shown to decrease total and LDL cholesterol and triglyceride levels. Furthermore, consumption of 0.5 to 1 clove of garlic per day has been shown to lower cholesterol level approximately by 10%(Warshafsky S et al., 1993; Spigelski D and Jones PJ,2001). It is reported that organosulfur compounds in garlic may be responsible for its therapeutic properties (Spigelski D and Jones PJ,2001; McAnlis GT et al.,1999; Lu Y et al ., 2012 ; Yeh YY and Yeh SM ,1994).

Numerous studies have also indicated that Organosulfur compounds in garlic and onions ;

flavonoids, vitamin C and limonene in citrus fruits are plant – derived bioactive compounds - extra - nutritional constituents that typically occur in small quantities in foods and have antioxidant properties (Spigelski D and Jones PJ,2001; McAnlis GT et al., 1999) . These compounds vary widely in chemical structure, and functions . They are scientifically proven to have a protective effects on general health and specifically on different types of cancer and cardiovascular diseases (Benavente Garcia O Castillo J, 2008; Kris Etherton PM et al., 2002) .

Attempts to control cancer growth by these compounds involve a variety of means including, suppressing: preventing the formation of new cancers from procarcinogenes, blocking : preventing carcinogenic compounds from reaching critical initiation sites, and transformation : facilitating the metabolism of carcinogenetic compounds into less toxic materials or preventing their biological actions(Benavente Garcia O Castillo J, 2008) . They also play a significant role in reducing cardiovascular disease risk through an improvement in vascular function and lowering high total cholesterol and reducing the generation of oxidized LDL levels. Furthermore, they regulate blood pressure through decreasing the ability of platelets in the blood to clot (Benavente Garcia O Castillo J, 2008) .

The mechanism/s of the hypocholesterolemia effects of bioactive compounds in garlic and lemon are not fully understood. However, they may exert their antioxidant activity in several ways. They may directly scavenge some radical species by acting as chain breaking antioxidants (McAnlis GT et al ., 1999) , They may suppress lipid per oxidation by recycling other antioxidants or by chelating pro oxidant metal ions such as iron and copper that prevents free radical formation from these pro oxidants while simultaneously retains their own free radical scavenging capability (McAnlis GT et al ., 1999) . Furthermore, mechanisms that explain the antioxidant effects of garlic includes a decrease in cholesterol and fatty acid hepatic synthesis and cholesterol absorption (Yeh YY and Yeh SM , 1994).

The objective of the present work was to investigate whether use of lemon and fresh garlic liquid mixture could be considered as an important factor in lowering plasma total cholesterol , low density lipoprotein and triglyceride levels . For this purpose mild hypercholesterolemic women (n=45) were assessed and studied in a time period of eight weeks.

2. Material and Methods

Population Selection

A total of n=45 females with cholesterol level of >230 mg/dL), nonsmoking, and age mean of (X=48± 6.0) participated in the study. A questionnaire from each participant regarding previous heart and coronary diseases, hypertension , and cholesterol medication use was completed. Out of 45 participants , n=15 (9 on cholesterol medication, 4 with hypertension , and 2 with other heart and coronary diseases) were excluded from the study and no further investigations were done.

The rest of the participants (n=30) randomized into 2 groups; treatment (n=15) & control (n=15) . They were intervened to take 150 mL of either lemon and fresh garlic liquid mixture or water after lunch for a period of 3 weeks, discontinue taking it for a week and then continue for another 3 weeks as well. The selected subjects were stable and yet not on any lipid medication/s . Furthermore, they were advised to maintain their normal life style and continue their habitual physical activity throughout the study , if any.

Serum Samples collection

Fasting blood samples were collected (n=30)at Reference health laboratory and after centrifugation at 1500 x g for 15 minutes , sera were separated from the cells . The samples were analyzed by Hitachi 902 colorimetric system for blood total cholesterol, LDL ,HDL, and TG levels . The collection procedures and analysis were repeated end of 8weeks as well to complete the protocol (baseline and 8weeks).

Liquid Mixture Combination

Fresh garlic and lemons were purchased from a local market in Tehran. Total of 5 unpeeled lemons were selected, cut and seeds were taken away. They were combined with 30 cloves of garlic in a mixer and mixed. Then , total volume adjusted to one liter with water and was brought to boil, only for a short time. The mixture was kept refrigerated throughout (Seagle K ,2011).

3. Results

Tables 1-3 show the obtained results for control and treatment groups. Daily consumption of the liquid mixture for 8 weeks improved lipids level and 7.7% reduction in total cholesterol, 10.7% in LDL , and 11.7% in triglycerides in treatment group were obtained . No significant reduction was observed in control group after 8 weeks and HDL levels remained unchanged in both groups (data not shown) . Data were analyzed by SPSS and p values obtained from paired T-test.

Table 1:Participants Information

GENDER	Total # of participants	Participants on Medications	Participants with Heart & Coronary Diseases	participants With hypertension	Mean (sd) Age	Smoking
FEMALS	45	9	2	4	48± 6.0	NO

Table2: Obtained Results (Control)

CONTROL GROUP (n=15)	RANGE (before, after)	BEFORE TREATMENT (x±sd)	AFTER TREATMENT (x±sd)	% REDUCTION	p PAIRED T TEST
TOTAL CHOLESTROL (mg/dL)	(234-290) & (235-289)	266 ± 17.0	265 ±16.5	<1	0.17
LDL (mg/dL)	(142-195) & (144-191)	161±13.2	160 ±11.6	<1	0.52
TG (mg/dL)	(107-182) & (103-184)	156±19.9	156 ±20.5	0	0.82

Table3: Obtained Results (Treatment)

TREATMENT GROUP (n=15)	RANGE (before, after)	BEFORE TREATMENT (x±sd)	AFTER TREATMENT (x±sd)	% REDUCTION	p PAIRED T TEST
TOTAL CHOLESTROL (mg/dL)	(247-295) & (212-280)	273 ±16.1	252 ±19.6	7.7	0.001
LDL (mg/dL)	(143-198) & (130-176)	167 ±16.3	149 ±13.3	10.7	0.001
TG (mg/dL)	(141-185) & (124-162)	162 ±11.0	143±12.3	11.7	0.001

4. Discussions

Health claims regarding the cholesterol lowering benefits of lemon and garlic are widespread. However, the clinical evidence from numerous studies are inconsistent (Lu Y et al .,2012; Rahman KH,2001; Gardner CD et al.,2001). Yeh Yu-Yan ,2001 and Lijuan Liu reported that several types of garlic supplementation including those in pill form and those which are dissolved in water, may be able to slow the synthesis of cholesterol in the body . Furthermore, Gore JM, and Dalen JE suggested that garlic extract supplements have the ability to lower LDL cholesterol by 10% and total cholesterol by 7% in men with high cholesterol level. The result of another study showed no significant differences for HDL cholesterol and triglyceride levels (Gardner CD et al.,2001) . Yamad T et al .,2011 indicated frequent intake of citrus fruit may reduce the incidence of CVD. Furthermore, different preparation forms of garlic, different duration of use for garlic and citrus fruits are suggested (Benavente Garcia O Castillo J.,2008; Rahman KH ,2001; Gardner CD et al.,2001) .To date the author did 't find an investigation that blood lipids lowering effects of these dietary sources have been studied in combined form. In the present work, the lowering effects of combined two dietary sources; lemon and garlic on serum lipids level in mild hypercholesterolemic women have been investigated .

The obtained results in treatment group indicated more reduction in triglyceride level than the total and LDL cholesterol levels over eight

weeks period. Furthermore, no significant reduction was observed in HDL cholesterol level.

The author concludes that use of this combined mixture attributes to dietary supplementation to lower serum lipids level in mild hypercholesterolemic women . Thus may provide benefits on reducing CVD risk factors in this population. However, to further clarify the lowering effects of this mixture in specific groups including hypercholesterolemic men and women studies with large sample size are needed

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