

Effect of Honey and Olive Oil on Total Blood Cholesterol Level in the Healthy Individuals

Hafsa Alemam¹, Mustafa Abugeela², Yosra Lamami¹, Eman Gusbi¹, Nabil Enattah^{@1} and Abdullah Bashein³

¹Biotechnology Research Center (BTRC), Tripoli, Libya.

²Department of Biochemistry, Faculty of Pharmacy, University of Tripoli-Libya.

³Department of Biochemistry, Faculty of Medicine, University of Tripoli-Libya.

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ABSTRACT

Cholesterol is probably the best known steroid because of its association with atherosclerosis. Previous studies showed association of olive oil use with reduced serum cholesterol levels. In addition, honey has been shown to have beneficial effects on lipid profiles. This study was conducted to investigate the effects of olive oil and honey on total cholesterol level in healthy Libyan individuals.

The study was conducted on 75 Libya volunteers aged 40-55 years divided into 3 groups including, 25 olive oil group, 25 honey group, and 25 olive oil and honey group. The total cholesterol level was measured before and after the experiment and expressed as (mg/dL).

The chemical and physical properties of the olive oil used in this study found to be compatible with permitted limits issued by the Libyan National Center of Standardization and Metrology. The results showed that olive oil and honey significantly reduced total serum cholesterol ($P < 0.001$) and ($P < 0.05$) respectively. Furthermore, combination of olive oil and honey significantly reduced total cholesterol ($P < 0.001$) by 21%.

The utilization of olive oil and honey can lead to a significant decrease in the levels of total serum cholesterol in blood.

Keywords- Olive oil, Honey, Total cholesterol, Fatty acids, Gas chromatography

INTRODUCTION

Cholesterol is probably the best known steroid because of its association with atherosclerosis. Hypercholesterolemia, which is the increased levels of serum cholesterol, plays an important role in atherosclerosis development.¹ Previous studies showed association of olive oil with reduced serum cholesterol levels.² In addition, honey has been shown to have beneficial effects on lipid profiles.³

Olive oil is a form of liquid fat obtained from the fruit of the *Olea europaea* (olive tree), which is a traditional tree crop of the Mediterranean region. Olive fruit is pressed to produce this distinctive oil.⁴ In addition to its use as a diet, oil is used in cosmetics, medicine, and soaps. In the diet, olives can be eaten whole or chopped and added to pizzas and other dishes.⁵ The oil can be used as a dip for bread, for frying, or as a salad dressing. Some people even consume it by the small glassful for medicinal purposes.⁶

Some studies issued by the third international conference on the biological value of olive oil indicated that individuals who had 25 milliliters (5 teaspoons) of olive oil for one week had a decrease in blood cholesterol level and increase of antioxidants particularly vitamin E.⁷ Some researches confirmed that olive oil containing of a very high

proportion of unsaturated fatty acids especially oleic and linoleic acids have a significant role in decreasing the total blood cholesterol level as these acids convert a large part of nutritive cholesterol to bile salts giving liver the room or opportunity to make the cholesterol needed by the body.⁸

In addition to olive oil, from ancient times, honey is known to be one of the most beneficial natural drugs. Several studies showed that honey has many medicinal and surgical uses. It is established that honey improves insulin sensitivity and significant increase in the insulin secretion capacity is associated with decrease in circulating leptin and total cholesterol and improves hematological indices.⁹ Honey have been shown to lower fasting blood glucose, total cholesterol, LDL, VLDL, TG's and increases HDL, thus reducing cardiovascular risks.^{10,11} Honey is a substance with a high therapeutic value as it contains several compounds giving it its therapeutic value. It contains flavonoid compounds which have a key role in reducing blood fats. They also assist the body get rid of poisonous matters and deposits and protect arteries and veins.¹²⁻¹⁴

Therefore, this study was carried out to investigate the effects of olive oil and honey produced in Libya on total cholesterol level in healthy Libyan individuals.



MATERIALS AND METHODS

This study was conducted in the period from July to December 2008 in the Biotechnology Research Center in Tripoli.

Composition and quality testing of olive oil used in the study

Olive oil used in this study was obtained from Yefren region in Nafusa Mountain. Composition and quality properties of olive oil were tested to identify how compliant it is with the Libyan specifications issued by the National Center for Standardization and Metrology prior to its use as doses. The tested olive oil chemical and physical characteristics included: Fatty acids forming the oil, humidity, acidity, acidic number, peroxide number, saponification number, Iodine number, relative density, and Kariz test. Fatty acids forming olive oil were analyzed using the gas chromatograph (GLC) Model 6890 (Agilent, Wilmington, DE, USA).

Study subjects

Seventy five healthy subjects, aged from 40 to 55 years old, were selected randomly (55 men and 45 women), from several regions of the North West Libya. The subjects were divided into three groups including: Olive oil group (OOG), honey group (HG), and olive oil-honey group (OOHG). Each group consists of 25 subjects.

Subjects' treatment and blood collection

A baseline blood samples of 5 ml were collected in plain tubes from all participants forming the three different groups involved in this study. The blood was left to clot in plain tubes, centrifuged, and the serum was transferred to 1.5 ml tubes and stored at -20°C until used for cholesterol estimation, then, the OOG were given the olive oil dose (two large spoons) every morning for 6 weeks, the HG were given the honey dose (one large spoon) every morning for 6 weeks, and the OOHG were given the one spoon of honey and two spoons of olive oil doses every morning for 6 weeks. This was followed by withdrawing another blood sample of 5 ml in plain tubes. The blood samples were let to clot, centrifuged, and serum was separated and stored at -20°C in 1.5 ml tubes until used for cholesterol level measurement.

Total serum cholesterol measurement

Total serum cholesterol of the samples of the three groups were measured before and after treatment in the same way using the DIALAB kit (DIALAB, Neo Zealand) following the manufacturer's instructions.

Data was analyzed by excel, mean $\pm$ SD, frequency and percentages used to describe the data. Dependent *t*-test to compare means before and after treatment was used. *P* value < 0.05 considered significant.

RESULTS

The mean age of olive oil group was 49.47 $\pm$ 2.15 year, honey group was 50.07 $\pm$ 2.01, mixed olive oil and honey group was 52.07 $\pm$ 4.31 year.

Fatty acids forming olive oil

Fatty acids forming olive oil were studied and identified using GLC technology (Gas Liquid Chromatography – GLC). It was revealed that this sample contained a high proportion of unsaturated fatty acids including oleic acid (about 66.17%), followed by palmitic acid (15.50%), and linoleic acid (12.51%),

and less proportions of stearic acid (2.04%), and palmitoleic acid (1.66%), and very little amounts of linolenic acid (0.74%), arachidonic (0.57%), gadoleic acid (0.31%), heptadecenoic acid (0.20%), and heptadecanoic acid (0.15%).

Physical characteristics and quality of olive oil used as a dose:

The physical characteristics and quality of olive oil sample used as doses were investigated (Table 1) shows the analysis results of olive oil sample as compared to the permitted limits or ranges according to the documents of the National Center of Standardization and Metrology.

Table 1: Physical characteristics of olive oil used as doses in the study

Tests	Results	PLALS
Humidity	16%	20%
Acidity	2.8 mg/alkaline/g	3.3 mg alkaline/g
Acidic number	5.6 mg	6.6 mg
Peroxide number	16.9 mg equivalent	20.0 mg equivalent
Saponification number	191.34 mg	193.60 mg
Iodine number	80.76	75.0 - 94.0
Relative density	0.91 %	0.910 -0.916%
Kariz test	Negative	Negative

PLALS= Permitted Limits According to Libyan Specifications

Effect of olive oil and honey on total cholesterol level

The result showed that there was significant decrease in total cholesterol ($P<0.001$) by 16% after having two spoons of olive oil for 6 weeks in the morning. As for honey significant decrease was observed in total cholesterol ($P<0.05$) by 15% and decrease range from 6 to 39% after having one spoon of honey region for 6 weeks in the morning. Finally, having one spoon of multi-flower spring honey and two spoons of olive oil for 6 weeks led to a significant decrease in total cholesterol ($P<0.001$) by 21% and decrease range from 6 to 35% (Table 2).

Table 2: Total cholesterol (mg/dL) levels before and after dose administration.

Parameter	OOG	HG	OOHG
Pre-treatment TC (mg/dL)	188.07 $\pm$ 6.01	190.21 $\pm$ 8.11	181.01 $\pm$ 7.66
Post-treatment TC (mg/dL)	158.02 $\pm$ 2.13	160.41 $\pm$ 3.01	144.34 $\pm$ 4.11
Drop ratio %	16%	15%	21%
Rate of decline %	541-%	639-%	635-%
<i>P</i> -value	$P<0.001$	$P<0.05$	$P<0.001$



DISCUSSION

Using gas chromatography analysis of the olive oil sample in this study. The olive oil contained fatty acids, especially mono-unsaturated fatty acids such as oleic acid (66.17%) that was shown to reduce fat in the blood (Zambon et al, 1999).¹⁵ In addition, the results showed that olive oil used containing essential fatty acids, namely, linoleic and linolenic acids at relatively lower concentrations. These results are consistent with many previous studies related to this topic in Tunisia, Syria and Spain (Lewis and Hoeger, 2005)⁷ but the difference was in the proportion of these fatty acids, where the difference varies depending on the olive type and types of agricultural operations and the type of soil and maturity of fruits (Carrasco et al, 2005).¹⁶

The results revealed that the olive oil sample used as a dose complied with the Libyan specifications issued by the National Center for Standardization and Metrology (Libyan standard specifications, 2007).¹⁷

Cholesterol increase in blood is one of the chronic health problems associated with heart and artery diseases. Coronary heart diseases and arteriosclerosis due to cholesterol increase are the main cause of deaths in both developed and developing countries (Al-Nozha et al, 2016).¹⁸ The current study investigated the effect of olive oil and honey on total cholesterol in a sample of Libyan population.

Regarding the effect of olive oil and mixed (olive oil and honey) on total cholesterol (TC), our results showed that they have significantly lower TC. Our result is in agreement with the result of studies conducted in Spain (Lewis and Hoeger, 2005)⁷, and Egypt. (Simopoulos, 2002; Zhang and Kim, 2014; Kris-Etherton et al, 1999; Hu et al, 2001; Visioli and Galli, 2000).¹⁹⁻²³

Regarding the effect of honey on total cholesterol (TC) our results showed that honey administration led to a significant decrease in TC ($P < 0.05$). This is in agreement with the results of some previous studies conducted worldwide (Al-Waili, 2004; Kasianenko et al, 2011)^{10,24}, in disagreement with others (Münstedt et al, 2009).²⁵

Despite these results, which show the importance of olive oil and honey in lowering the total cholesterol in blood, we recommend further larger research on olive oil honey to separate their components and learn more about their components' effects.

CONCLUSION

Consumption of olive oil and/or honey for a period of 6 weeks is effective in reducing total cholesterol in healthy adults. Therefore, healthy individuals should include olive oil and honey in their diet to improve their glucose and cholesterol, and to prevent acquiring diseases caused by increased levels of total cholesterol such as cardiovascular diseases, hyperlipidemias.

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