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EFFECT OF HONEY AND OLIVE OIL ON SERUM CHOLESTEROL LEVELS: A PRELIMINARY STUDY

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Abstract:-

Cholesterol is probably the best known steroid because of its association with atherosclerosis. Previous studies shown association of olive oil use with reduced serum cholesterol levels. In addition, honey has been shown to have beneficial effects on lipid profiles. Therefore, this study was carried out 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 aged 49.47 ± 2.15, honey group aged 50.07 ± 2.01, olive oil and honey group aged 52.07 ± 4.31. 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 the study were found to be compatible with permitted limits issued by the Libyan National Centre of Standardization and Metrology .Our 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%. We conclude that 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 shown 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 milliliter (2 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, 13).

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 RESEARCH 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 reign 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). Analysis was done in the Biotechnology Research Center in Tripoli.

Testing the physical characteristics was performed in the laboratories of National Vegetable Oils Company in Tripoli.

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 of the groups consisting 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 let to clot in plain tubes, centrifuged, and the serum was transferred to 1.5 ml tubes and stored at -20^0C 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 samples of 5 ml in plain tubes. The blood samples were let to clot, centrifuged, and serum was separated and stored at -20^0C 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 Zeeland) following the manufacturer's instructions.

RESULTS

The average age of olive oil group was 49.47±2.15, honey group was 50.07±2.01, mixed olive oil and honey group was 52.07±4.31.

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

Test	Result Obtained	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
Anthropometric measurements (Mean ± SD) of the cholesterol concentrations in the study groups are shown in table 2. The last column of the table shows the P-value. The result shows that there is 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: shows total cholesterol (TC) (mg/dL levels before and after dose administration

Parameter	OOG	HG	OOHG
Pre-treatment TC (mg/dL	188.07±6.01	190.21±8.11	181.01±7.66
Post-treatment TC(mg/dL	158.02±2.13	160.41±3.01	144.34±4.11
Drop ratio %	%16	%15	%21
Rate of decline %	%41-5	%39-6	%35-6
p-value	p<0.001	p<0.05	p<0.001

P < 0.05 was considered statistically significant

DISCUSSION
As for the results of the gas chromatography analysis of the olive oil sample used 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 (14). In addition, our 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 (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 (15).
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 (16). 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 (17). 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 (18). Our result is in agreement with the result of studies conducted in Spain (7), and Egypt (19- 21). 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 (22, 23), in disagreement with others (24).
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 (25).

CONCLUSION
Consumption of olive oil and/or honey for a period of 6 weeks is effective in reducing total cholesterol in young 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 in which the levels of total cholesterol such as cardiovascular diseases, hyperlipidemias.

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