Olive and Sesame Oil Effect on Lipid Profile in Hypercholesterolemic Patients, Which Better?

Seyedeh Mahdieh Namayandeh, Fatemeh Kaseb¹, Soheila Lesan²

ABSTRACT

Background: The study on natural substances especially, dietary components such as liquid oils affecting cholesterol can be important for therapeutic propose. Sesame seeds with various biomedical actions can be control the hypercholesterolemia. On the other hand, olive oil has a wide range of therapeutic effect on lipid profile in human. The aim of this study is to evaluate and compare lipid profile changes after olive and sesame oils consumption in hypercholesterolemia.

Methods: This study was a clinical randomized trial that was performed via parallel design on 48 patients. The patients were randomly allocated in to two groups: A: olive oil and B: sesame oil. After 1 month prescription of Step I National Cholesterol Education Program diet, patients consumed 4 table spoons aprox. 60 g) of refined olive or sesame oil daily as an exchange of other oils, for 1 month. Lipid profiles The \( P < 0.05 \) was considered as significant difference.

Results: Out of 48 patients, 24 (50%) were men. The mean age was 41.7 ± 8.3 years. The mean of total cholesterol, triglyceride (TG), low density lipoprotein (LDL), cholesterol, and high density lipoprotein (HDL) cholesterol, before oil consumption was 224.5 ± 22, 256 ± 132, 132.6 ± 9, and 44.5 ± 11 mg/dl. After olive oil consumption cholesterol, TG, LDL-C, weight, waist and BMI were decreased and HDL-C was increased. After sesame oil consumption cholesterol, TG, LDL-C were significantly decreased. Weight, waist were decreased and HDL-C was increased (\( P > 0.05 \)).

Conclusions: Sesame oil had equivalent effect on lipid profile in comparison olive oil and lipid profile improvement was better in sesame oil in LDL-C and TG.

Keywords: Hypercholesterolemia, olive oil, sesame oil

INTRODUCTION

The study on natural substances especially, dietary components affecting cholesterol can be important for therapeutic propose. Sesame seed with various biomedical actions such as an effect on lipid metabolism in human and animal models according to
trial can be and control of hypercholesterolemia.\textsuperscript{[1]}

On the other hand, olive oil has a wide range on therapeutic effect on lipid profile in human.\textsuperscript{[2]}

Olive oil is a major part of Mediterranean diet that is linked to reduced incidence of degenerative diseases particularly coronary heart disease and cancer of blood, skin, and colon.\textsuperscript{[3]}

Despite the high-fat content of “Mediterranean diet” it has been suggested the type of fat is more important than the total amount consumed.

The major components of olive oil thought to contribute to its health benefits are: Oleic acid, phenolic compounds, and squalene.\textsuperscript{[4]}

Dietary fat composition such as: Polyunsaturated fatty acid, mono unsaturated fatty acid (MUFA), and saturated fatty acid can effect on plasma lipids and lipoproteins that associated with the development of artherosclerosis and ischemic heart diseases.

**METHODS**

This study was a clinical randomized trial that was performed via parallel design on 48 patients. The inclusion criteria were cholesterol \(>200\) and \(<240\) mg/dl and the patients who did not received any lipid lowering prescriptions.

The participants were prescribed step I diet (report of Adult panel III from National Cholesterol Education Program) for 1 month before oil prescription. After that, the patients consumed daily 4 table spoons; approximately 60 g, of refined olive or sesame oil that exchange for any oil in diet, over period of 1 month.

The patients were randomly allocated in to two groups: A - Olive oil and B - Sesame oil.

They were advised to followed step I diet during study.

Informed consent was obtains from all participants. This study was approved by ethic committee of Yazd medical university.

Plasma was isolated after 12 h overnight fasting period. Serum lipids (total cholesterol, high density lipoprotein-cholesterol [HDL-C], and triglyceride [TG]) were measured by laboratory method as described before\textsuperscript{[5]} and Low density lipoprotein-cholesterol (LDL-C) was calculated by Fried Wald formula before and after oil prescriptions.

**Statistics**

We use paired \(t\)-test for comparing of serum level of lipid profile and other measures of biomarkers before and after oil consumption. Probability <0.05 was considered as significance level. 95% Confidence Interval (CI) of \(D\) (difference between percent of decrease in biomarkers in two treatment groups) was considered for non-inferiority hypothesis where \(D\) is the magnitude of pre-specified difference between outcome rates with the sesame oil as new and olive oil as standard treatments. The null hypothesis (H0) implies that the new and standard treatments have differing outcome rates. In this study, \(D = 1\%\).

**RESULTS**

Out of 48 patients, 24 (50\%) were men. The mean age was 41.7 ± 8.3 years (44.7 ± 7.2 in men and 48.6 ± 8.4 in woman)\textsuperscript{[6]}.

The mean of total cholesterol, TG, LDL-C, and HDL-C before oil consumption was 224.5 ± 22, 256 ± 132, 132.6 ± 9, and 44.5 ± 11 mg/dl.

The Base line data of patient were summarized in Table 1.

As Table 1; shows weight and cholesterol were significantly higher in women than the men \((P < 0.05)\).

After olive oil consumption cholesterol, TG, LDL-C, weight, waist, and BMI were decreased and HDL-C was increased HDL-C \((P > 0.05)\) [Table 2].

After sesame oil consumption cholesterol, TG, LDL-C, and were significantly decreased. Weight, waist were decreased, and HDL-C was increased \((P > 0.05)\) [Table 3].

Table 4 shows lipid profiles before and after diet therapy (step I Adult panel III NCPE). Cholesterol, TG, LDL-C and HDL-C were unchanged and Weight was significantly decreased after diet therapy \((P = 0.005)\) [Table 4].

In comparison of olive and sesame oils, sesame oil had better improvement effect on lipid profile and weight management [Table 5].

We evaluated non-inferiority analysis. Table 6 shows sesame oil had equivalent effect on lipid profile in comparison olive oil and lipid profile improvement was better in sesame oil in LDL-C and TG.

**DISCUSSION**

This study showed that vegetable oils such as olive and sesame can improve lipid profiles, but there is no difference observed between
two oils. Sesamin, as a major lignan in sesame seeds has multiple functions such as cholesterol lowering, anti-hypertensive, anti-cancer, and lipid lowering effect. It induces expression of aldehyde dehydrogenase (an alcohol-metabolizing enzyme) gene, as a result the sesamin regulate metabolism of lipid, xenobiotics, and alcohol at level of mRNA.\textsuperscript{[4,5]} A daily 25-mL dose of all types of olive oil, reduced lipid cardiovascular risk-factors, and improved glutathione antioxidant status. Daily consumption of high- and medium-polyphenol olive oil decreased

### Table 1: Baseline characteristics in participants

<table>
<thead>
<tr>
<th></th>
<th>Men mean (SD)</th>
<th>Women mean (SD)</th>
<th>Total mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic. BP (MmHg)\textsuperscript{a}</td>
<td>128 (15)</td>
<td>122 (17)</td>
<td>125 (16)</td>
<td>0.5</td>
</tr>
<tr>
<td>Diastolic. BP (MmHg)</td>
<td>81 (8.3)</td>
<td>81 (9.9)</td>
<td>81 (8.8)</td>
<td>1</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>81.7 (10)</td>
<td>72.5 (7)</td>
<td>77 (9)</td>
<td>0.05</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>100 (7)</td>
<td>96 (9)</td>
<td>98 (8)</td>
<td>0.3</td>
</tr>
<tr>
<td>LDL-C\textsuperscript{*} (mg/dl)</td>
<td>124 (18)</td>
<td>140 (17)</td>
<td>132 (19)</td>
<td>0.5</td>
</tr>
<tr>
<td>HDL-C\textsuperscript{**} (mg/dl)</td>
<td>43.6 (9)</td>
<td>45 (13)</td>
<td>44 (11)</td>
<td>0.7</td>
</tr>
<tr>
<td>TG\textsuperscript{***} (mg/dl)</td>
<td>227 (138)</td>
<td>237 (20)</td>
<td>224 (22)</td>
<td>0.3</td>
</tr>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>211 (16)</td>
<td>237 (20)</td>
<td>224 (22)</td>
<td>0.01</td>
</tr>
<tr>
<td>FBS (mg/dl)</td>
<td>139 (9)</td>
<td>110 (37)</td>
<td>101 (28)</td>
<td>0.2</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Significance differences between men and women, \textsuperscript{B}P=Blood pressure, \textsuperscript{*}LDL-C=Low density lipoprotein-cholesterol, \textsuperscript{**}HDL-C=High density lipoprotein-cholesterol, \textsuperscript{***}TG=Triglyceride, FBS=Fasting blood sugar, SD=Standard deviation

### Table 2: The lipid profile and weight and waist before and after of olive oil prescription

<table>
<thead>
<tr>
<th></th>
<th>(SD) Before mean (SD)</th>
<th>(SD) After mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>213 (36)</td>
<td>206 (27)</td>
<td>0.09</td>
</tr>
<tr>
<td>TG\textsuperscript{*} (mg/dl)</td>
<td>212 (100)</td>
<td>185 (70)</td>
<td>0.2</td>
</tr>
<tr>
<td>LDL-C\textsuperscript{**} (mg/dl)</td>
<td>123 (22)</td>
<td>121 (20)</td>
<td>0.6</td>
</tr>
<tr>
<td>HDL-C\textsuperscript{***} (mg/dl)</td>
<td>44.4 (10)</td>
<td>46 (9.9)</td>
<td>0.1</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>75 (8)</td>
<td>74 (9)</td>
<td>0.5</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>94.6 (5.9)</td>
<td>93.3 (65)</td>
<td>0.6</td>
</tr>
<tr>
<td>BMI (kg/m\textsuperscript{2})</td>
<td>27.4 (3)</td>
<td>27.3 (3)</td>
<td>0.6</td>
</tr>
</tbody>
</table>

\textsuperscript{*}TG=Triglyceride, \textsuperscript{**}LDL-C=Low density lipoprotein-cholesterol, \textsuperscript{***}HDL-C=High density lipoprotein-cholesterol, BMI=Body mass index

### Table 3: The mean of lipid profiles weight, waist and body mass index before and after of sesame oil consumption

<table>
<thead>
<tr>
<th></th>
<th>(SD) Before mean (SD)</th>
<th>(SD) After mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>226 (36)</td>
<td>210 (23)</td>
<td>0.058</td>
</tr>
<tr>
<td>TG\textsuperscript{*} (mg/dl)</td>
<td>223 (100)</td>
<td>173 (89)</td>
<td>0.013</td>
</tr>
<tr>
<td>LDL-C\textsuperscript{**} (mg/dl)</td>
<td>138 (26)</td>
<td>124 (20)</td>
<td>0.03</td>
</tr>
<tr>
<td>HDL-C\textsuperscript{***} (mg/dl)</td>
<td>44 (10)</td>
<td>45 (10)</td>
<td>0.4</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>75 (8)</td>
<td>74 (9)</td>
<td>0.1</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>94.6 (4)</td>
<td>94.6 (4)</td>
<td>1</td>
</tr>
</tbody>
</table>

\textsuperscript{*}TG=Triglyceride, \textsuperscript{**}LDL-C=Low density lipoprotein-cholesterol, \textsuperscript{***}HDL-C=High density lipoprotein-cholesterol

### Table 4: Mean and standard deviations of lipid profiles before and after diet therapy (step 1 Adult panel III National education cholesterol program $)

<table>
<thead>
<tr>
<th></th>
<th>(SD) Before mean (SD)</th>
<th>(SD) After mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>224 (22)</td>
<td>226 (36)</td>
<td>0.7</td>
</tr>
<tr>
<td>TG\textsuperscript{*} (mg/dl)</td>
<td>256 (105)</td>
<td>223 (105)</td>
<td>0.18</td>
</tr>
<tr>
<td>LDL-C\textsuperscript{**} (mg/dl)</td>
<td>134 (19)</td>
<td>138 (26)</td>
<td>0.3</td>
</tr>
<tr>
<td>HDL-C\textsuperscript{***} (mg/dl)</td>
<td>44.8 (1)</td>
<td>44 (10)</td>
<td>0.6</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>77 (9)</td>
<td>75 (8)</td>
<td>0.005</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>94.6 (6)</td>
<td>94.6 (6)</td>
<td>1</td>
</tr>
</tbody>
</table>

$=National education cholesterol program, \textsuperscript{*}TG=Triglyceride, \textsuperscript{**}LDL-C=Low density lipoprotein-cholesterol, \textsuperscript{***}HDL-C=High density lipoprotein-cholesterol

### Table 5: Lipid profiles before and weight changes in two treatment groups A (sesame) and B (olive) mean, SD, MIN and MAX of lipid profile changes in olive oil minus sesame oil

<table>
<thead>
<tr>
<th></th>
<th>Sesame oil mean (SD)</th>
<th>Olive oil mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>-5.4 (44)</td>
<td>-6.5 (13)</td>
<td>0.84</td>
</tr>
<tr>
<td>TG\textsuperscript{*} (mg/dl)</td>
<td>-41.1 (44)</td>
<td>-27 (81)</td>
<td>0.4</td>
</tr>
<tr>
<td>LDL-C\textsuperscript{**} (mg/dl)</td>
<td>-5 (21)</td>
<td>-1.8 (13)</td>
<td>0.4</td>
</tr>
<tr>
<td>HDL-C\textsuperscript{***} (mg/dl)</td>
<td>8 (5.9)</td>
<td>2.07 (4.8)</td>
<td>0.43</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>-4.8 (15)</td>
<td>-0.18 (1.1)</td>
<td>0.24</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>-0.16 (1.6)</td>
<td>0.6 (3.5)</td>
<td>0.9</td>
</tr>
</tbody>
</table>

\textsuperscript{*}LDL-C=Low density lipoprotein-cholesterol, \textsuperscript{**}HDL-C=High density lipoprotein-cholesterol, \textsuperscript{***}TG=Triglyceride

www.mui.ac.ir
Oxidative damage on lipids. Consumption of olive oil with high phenolic content provided the greatest benefits by increasing HDL cholesterol levels and reducing the oxidative damage on lipids. Very recently, MUFA-rich diets were reported to decrease plasma total cholesterol and LDL-C without decreasing HDL-C in humans. In contrast to some recent reports, a study indicates that a large amount of dietary MUFA may raise some fractions of plasma lipids in humans. The present study indicates that a large amount of dietary MUFA may raise plasma lipids, especially TGs. It is not known whether this effect is harmful. However, the possibility that MUFA may also increase liver cholesterol in humans may need consideration.


REFERENCES


Table 6: Mean, standard deviation, MIN and MAX of lipid profile changes in olive oil minus sesame oil

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol changes</td>
<td>14</td>
<td>-86.95</td>
<td>24.61</td>
<td>-3.52</td>
<td>28.14</td>
</tr>
<tr>
<td>LDL-C changes</td>
<td>13</td>
<td>-35.39</td>
<td>28.86</td>
<td>1.88</td>
<td>18.42</td>
</tr>
<tr>
<td>HDL-C changes</td>
<td>13</td>
<td>-24.04</td>
<td>25.53</td>
<td>1.62</td>
<td>15.55</td>
</tr>
<tr>
<td>Triglyceride changes</td>
<td>14</td>
<td>-32.92</td>
<td>100.72</td>
<td>14.41</td>
<td>39.47</td>
</tr>
</tbody>
</table>

*LDL-C=Low density lipoprotein-cholesterol, **HDL-C=High density lipoprotein-cholesterol, ***TG=Triglyceride

Low sample size can be considered as a limitation of our study and hence we suggest to perform study with higher sample size in future.

Source of Support: Nil, Conflict of Interest: None declared.