# Report

## Olive oil as medicine: the effect on blood pressure

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# Olive oil as medicine: the effect on blood pressure

This report reviews the literature for the effect of extra virgin olive oil (EVOO) on blood pressure. The report is the second in a series that summarizes significant published studies examining the effect of EVOO on clinical risk factors for chronic diseases. The first report evaluated studies that examined the effect of EVOO on blood lipid and lipoproteins; it also included information on olive oil standards and quality. These reports provide clinicians with science-based information and practical advice on how to advise patients to incorporate EVOO into their diet.

## Summary


- Daily use of at least two tablespoons of EVOO can lower blood pressure.
- EVOO with higher phenol content can provide more benefits than EVOO with lower phenol content.
- Future studies should examine the extent that specific phenols in EVOO are related to reducing blood pressure.


## Background

Phenols are essential to EVOO's health benefits. Due to minimal processing, EVOO is the only oil that retains important natural phenols. EVOO is processed in a manner similar to many fruit juices: the fruit is crushed and the juice is extracted. In contrast, the other grades of olive oil ("pure" and "light"), as well as inexpensive oils such as soybean and canola, go through an industrial refining process that strips away phenols. EVOO with a higher phenolic content may have a more robust flavor, including some bitterness, than EVOO with lower phenolic content. Phenolic content diminishes with time, and particularly when exposed to heat, light and oxidation, so EVOO should be stored in a cool dark place and used within a couple months of opening a container.

## Methodology

PubMed was searched for human studies written in English published from January 1998 through July 2015. All computer searches used the word "olive oil" combined with the risk-factor key words of "blood pressure" and, separately, "hypertension." Inclusion criteria were: human studies; randomized, controlled trials testing the effect of olive oil on at least one of the listed clinical risk factors. Studies were included that listed "olive oil" without further description. Exclusion criteria were: lack of randomization; lack of control group; animal or in vitro studies; use of other oils or foods in combination with olive oil; lack of information on amount of olive oil tested; studies that only used one meal with olive oil; stated use

of pomace oil, only refined olive oil, olive oil extracts, or only olive oil components (e.g., phenols). Observational studies and review articles were also excluded.

**Finding: EVOO may reduce blood pressure.** *Our analysis of seven key studies found that EVOO with a total phenol content of at least 161 mg/kg at a minimum intake of two tablespoons (25 ml) a day could significantly decrease systolic blood pressure in as little as three weeks. EVOO that contains at least 300 mg/kg total phenols may also decrease diastolic blood pressure.*

## Discussion

Table 1 summarizes eight key studies that we identified based on our methodology that point to extra virgin olive oil consumption (EVOO) as beneficial to lowering blood pressure. In 2000, Ferrara, et al. published the first study that examined the effect of EVOO on blood pressure. The study included 23 hypertensive men and women (age range: 25 to 70 years) and compared daily consumption of EVOO to sunflower oil over six months (1). The study found that EVOO was more effective than sunflower oil in reducing both systolic blood pressure and diastolic blood pressure. In addition, eight of the 23 participants (35 percent) were able to discontinue their hypertensive medications after six months of daily use of EVOO.

Some studies indicate that systolic blood pressure may be more responsive to EVOO compared to diastolic blood pressure, if the comparison is to an oil that is rich in polyunsaturated fats. For example, Perona, et al. studied 62 elderly (mean age: 84 years) men and women in Spain, half of whom had hypertension, and compared four weeks each of 60 grams a day of EVOO or sunflower oil (2). Systolic blood pressure was decreased to what the authors considered "normalized" (136 ± 10 mmHg) in the hypertensive participants after the EVOO phase, compared to the sunflower oil (150 ± 8 mmHg), but neither oil had a significant impact on diastolic blood pressure. In a study by Rozati, et al. of 41 overweight (BMI 29 ± 1 kg/$m^2$), but otherwise healthy adults, three months daily intake of EVOO compared to 49 grams day of a corn and soybean oil combination (control) lowered systolic blood pressure, but there was no difference between the oils for diastolic blood pressure (3).

Other studies indicate that specific phenols could determine the degree of blood-pressure-lowering effect as the results from studies reporting only the total phenol content are not consistent for systolic and diastolic improvement. For example, Fito, et al., studied 40 men (mean age = 67) with coronary heart disease, 19 of whom had hypertension, and compared refined olive oil (ROO) containing very little phenols to EVOO with a moderate total phenol content (161 mg/kg total phenols) (4) for three weeks of daily consumption. The EVOO phase significantly decreased systolic blood pressure for the hypertensive participants compared to the ROO phase (mean difference for EVOO compared to ROO = -2.53 mmHg). However, neither of the oils had a significant impact on diastolic blood pressure.

In contrast, the EUROLIVE (Effect of Olive Oil Consumption on Oxidative Damage in European Populations) study (Castaner, et al.) found that total phenol content may have an impact on diastolic but not systolic blood pressure. The study compared ROO to EVOO with a moderately high total phenol content of 366 mg/kg at 25 ml/day for three weeks in 18 healthy men. The study found that compared to the ROO, the high total phenol EVOO reduced diastolic blood pressure, but neither oil had a significant impact on systolic blood pressure (5).

Another key study found that EVOO with a high total phenol content may reduce both systolic and diastolic blood pressure. Moreno-Luna, et al. studied 24 young women classified with high-normal blood pressure (120-139/80-89 mmHg) or Stage 1 essential hypertension (140-159/90-99 mmHg) who consumed EVOO with 564 mg/kg total polyphenol or ROO for eight weeks each (6). Compared to the ROO, the EVOO decreased systolic blood pressure and diastolic blood pressure. It is noteworthy that this study showed that high phenol EVOO was more effective in reducing blood pressure than the reductions reported from the DASH study (Dietary Approaches to Stop Hypertension) (7), which required consuming close to nine servings per day of fruits and vegetables to lower systolic blood pressure by 2.8 mmHg and diastolic blood pressure by 1.1 mmHg.

There is also a study that found that EVOO could provide blood pressure reduction to those who do not typically eat a Mediterranean diet. Bondia-Pons studied 160 men from Northern Europe, Central Europe, and Mediterranean countries. The study required the consumption of 25 mL of three olive oils with three levels of phenols (8), with each oil consumed for three weeks. Although the changes in blood pressure were compared only after all three phases were completed, and not after each of the oils individually, the results showed a significant three percent decrease in systolic blood pressure in the non-Mediterranean subjects, while there was no change in the Mediterranean subjects. In addition, the post-study blood pressure of the men from the non-Mediterranean countries was found to be similar to the lower baseline values of the men from the Mediterranean countries.

Table 1. Summary of key studies showing effectiveness of EVOO in lowering blood pressure

| STUDY | SUBJECTS | COMPARISON | SYSTOLIC | DIASTOLIC |
|---|---|---|---|---|
| Ferrara, et al. (2000) | 23 men and women, age 25 - 70, with hypertension | EVOO vs. sunflower (40 g/day for males and 30 g/day for females) for six months | EVOO more effective<br>EVOO: 127 ± 14 mmHg<br>SO: 135 ± 13 mmHg<br>P=0.05 | EVOO more effective<br>EVOO: 84 ± 8 mmHg<br>SO: 90 ± 8 mmHg<br>P=0.01 |
| Perona et al. (2004) | 62 elderly men and women, mean age 84, half had hypertension | EVOO vs. sunflower (60 g/day) for four weeks | EVOO more effective<br>EVOO: 136 ± 10 mmHg<br>SO: 150 ± 8 mmHg | Neither had significant impact |
| Rozati, et al. (2015) | 41 overweight but healthy men and women, mean age 72 ± 1 | EVOO (46 g/day) vs. soy/corn (49 g/day) for three months | EVOO more effective<br>EVOO: 122 ± 2 mmHg<br>Soy/Corn: 126 ± 3 mmHg<br>P=0.04 | Neither oil had significant impact |
| Fito, et al. (2005) | 40 men with coronary heart disease, 19 with hypertension, mean age 67 | EVOO (161 mg/kg total phenols) vs. ROO (15 mg/kg total phenols) at 50 mL/day for three weeks | EVOO more effective<br>EVOO: -2.53 mmHg mean difference compared to ROO | Neither oil had significant impact |
| Castaner, et al. (2011) | 18 healthy men, mean age 38.2 ± 11.5 | EVOO (366 mg/kg total phenols) vs. ROO (2.7 mg/kg total phenols) at 25 mL/day for three weeks | Neither oil had significant impact | EVOO more effective<br>EVOO: -1.22 ± 1.04 mmHg<br>ROO: +2.78 ± 1.7 mmHg<br>P=0.43 |
| Moreno-Luna, et al. (2012) | 24 women, age 24 - 27, with high-normal blood pressure or stage 1 essential hypertension | EVOO (564 mg/kg total phenols) vs. ROO at 60 mL/day for eight weeks | EVOO more effective<br>EVOO: -7.9 ± 9.5 mmHg<br>ROO: -1.65 ± 8.2 mmHg<br>P<0.001 | EVOO more effective<br>EVOO: -6.6 ± 6.6 mmHg<br>ROO: -2.2 ± 7.2; mmHg<br>P<0.001 |
| Bondia-Pons, et al. (2007) | 160 men from Northern Europe (50 from Finland and Denmark), Central Europe (60 from Germany), and Mediterranean Countries (45 from Italy and Spain), mean age 33.3 ± 11.1 | EVOO (366 mg/kg and 164 mg/kg) vs. ROO (2.7 mg/kg) at 25 mL/day for three weeks for each of the oils (nine weeks total). | Olive oil effective for Northern and Central Europe subjects. | None of the oils had a significant impact. |

*EVOO = extra virgin olive oil, ROO = refined olive oil*

## Conclusions

Our review of key published studies indicates that daily use of at least two tablespoons of EVOO can lower blood pressure, compared to oils rich in polyunsaturated fats or to refined olive oil. EVOO with a higher total phenolic content may be more effective than EVOO with a lower phenolic content in lowering blood pressure. It is not clear why EVOO with a higher total phenolic content has differing effects on systolic and diastolic blood pressure as summarized in Table 1. One explanation is that specific phenols could have greater effects than others, an issue that the studies in this report did not examine. Specific phenols and their amounts vary greatly depending on olive variety, growing conditions, and harvesting. Future research should seek to verify the level of total phenols needed for blood pressure improvements and to determine which specific phenols have a greater effect on blood pressure. The currently available

research, however, indicates that a trial of daily use of EVOO could be considered prior to prescribing medication for any person with hypertension.

## References


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## Authors

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