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AIM
The aim of this project was to:
• Search the literature for systematic literature reviews (SLRs) or meta-analyses on olive oil and/or the Mediterranean Diet
• Provide a brief summary of the SLRs for ten health outcomes to be used to update the Olive Wellness Institute (OWI) website

METHODOLOGY
The following methodology was used to obtain all SLRs on olive oil and/or the Mediterranean diet:
• PUBMED and Web of Science databases were searched for studies published from the year 2000 to June 2018.
  • The search was limited from the year 2000, as all previously published reviews would be out dated, and all previous studies would be captured in more recent reviews of the literature.
• Search terms included: Mediterranean diet OR Mediterranean OR Olive oil OR Extra virgin olive oil OR Virgin olive oil OR EVOO OR VOO AND Review OR Systematic review OR Systematic literature review OR SLR OR Meta-analysis OR Meta-analyses.
  • Limited to reviews in English and in humans (children or adults).
• Titles and abstracts were scanned for the following inclusion criteria:
  • Systematic reviews or meta-analysis.
  • Experts/narrative reviews or individual studies were not considered.
  • Reviews focused specifically on the Mediterranean diet or on olive oil (any type)
  • This included reviews that looked at the Mediterranean diet alongside other diets.
  • Any health outcome or related measure (e.g. adherence, cost-effectiveness, etc.).
• Studies were categorised into 14 health outcomes, and ten outcomes were included in this summary report.

The most recent and relevant review was selected and summarised for each of the ten health outcomes.
Studies were chosen based on:
Diet: Studies specifically on olive oil were prioritised over those on the Mediterranean diet, when available
Publication date: Studies with the most recent publication date
Outcomes: Studies that reported the largest range of measures relevant to the outcomes of interest (i.e. more than one risk factor for cardiovascular disease)
Quantitative assessment: Studies that performed a meta-analysis
Quality of evidence: Highest quality of evidence (i.e. RCTs prioritised over cross-sectional studies)
Impact factor: Studies published in a journal with the highest impact factor of the journal
Citations: When studies had a similar publication date, those with the greatest number of citations

Data were obtained for each paper on:
Study type Diet or food investigated
Outcomes measured Population studied
Key study results Quality assessment

Upon assessment of the review, we provided:
A one-sentence summary
A list of its limitations
The bottom line of what the research means

The other review papers identified via the literature search are listed at the end of each health outcome section.
High phenolic olive oils lead to a small reduction in systolic but not diastolic blood pressure and oxidized LDL compared to low phenolic olive oils, and there was no difference in cholesterol, triglycerides and malondialdehyde.


**What is the effect?**

- Reduction in systolic blood pressure
- Reduction in oxLDL-level

To view the full results, visit: [olivewellnessinstitute.org](http://olivewellnessinstitute.org)

**Key Results**

**Reduction in Systolic Blood Pressure:**

(mean difference = −0.52; CI −0.77, −0.27; p < 0.01) (2 studies)

**Reduction in oxLDL-level:**

(mean difference = −0.25; CI −0.50, 0.00; p = 0.05) (4 studies)

**No Effect for Diastolic Blood Pressure**

(2 studies), malondialdehyde (2 studies), total cholesterol (6 studies), HDL-c (6 studies), LDL-c (6 studies), and TG (6 studies)
WHAT’S THE BOTTOM LINE?

Some evidence for the positive effects of high phenolic olive oil on reducing systolic blood pressure, but the available data are too limited to draw a solid conclusion.

Future research should specifically focus on the efficacy of high phenolic olive oil in blood pressure reduction, including dose-response trials.

OTHER REVIEWS


To view our resource database, visit:

www.olivewellnessinstitute.org
Health effects of olive oil and the Mediterranean diet

CARDIOVASCULAR DISEASE

EFFECT SIZE

Olive oil consumption significantly reduced the risk of cardiovascular disease (CVD) risk and stroke, but not specifically for coronary heart disease (CHD) risk.


What is the effect?

- 24% reduced risk of stroke*
- 18% reduced risk of CVD*

*For an additional 25 grams of olive oil per day

To view the full results, visit: olivewellnessinstitute.org

WHAT IS THE QUALITY OF THE EVIDENCE?

No prior CVD diagnosis

- All studies were from Mediterranean countries
- 9 studies
- 3 case-controls, 5 cohorts and 1 clinical trial

KEY RESULTS

<table>
<thead>
<tr>
<th>CHD</th>
<th>STROKE</th>
<th>CVD (CHD OR STROKE AS ENDPOINT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No significant association between olive oil consumption and the risk of CHD (7 studies).</td>
<td>A significant inverse association between olive oil and the risk of stroke (3 studies): 24% reduced risk of stroke for an additional 25 grams of olive oil per day (95% CI 0.67, 0.86; P&lt;0.001).</td>
<td>Significant inverse association between olive oil and risk of CVD (n=9 studies): 18% reduced risk of CVD for an additional 25 grams of olive oil per day (95% CI 0.70, 0.96; P=0.01).</td>
</tr>
</tbody>
</table>
WHAT TO KEEP IN MIND?

Limitations

- Substantial heterogeneity was observed among the studies for CHD.
- There were a small number of studies available, and the different study designs were not taken into account in most of the studies.
- All studies were conducted in Mediterranean countries and the applicability of these findings to other populations is unknown.
- There was evidence found for publication bias.

WHAT’S THE BOTTOM LINE?

There is evidence for an association between olive oil consumption and reduced risk of cardiovascular disease, and specifically for stroke.

However, no significant protection was found for CHD overall, suggesting that the effect for stroke may be driving the relationship. Further studies that better distinguish between extra virgin olive oil vs. ordinary olive oil with respect the risk of CHD are needed, since the phenolic concentration in extra virgin olive oil is much higher.

OTHER REVIEWS


To view our resource database, visit:

www.olivewellnessinstitute.org
Olive oil consumption decreased total cholesterol (TC), LDL cholesterol (LDL-C), and triglycerides (TG) significantly less than other plant oils, and increased HDL cholesterol (HDL-C) significantly more than other plant oils.


What is the effect?

- Decreased LDL-C
- Increased HDL-C
- Decreased Total Cholesterol
- Decreased Triglycerides

What is the quality of the evidence?

- 10 grams of olive oil per day
- Compared to another plant oil as the control
- 27 Random controlled trials
- At least 2 weeks duration

To view the full results, visit: olivewellnessinstitute.org

No effect for Apolipoprotein A (Apo A) or Apolipoprotein B (Apo B)
WHAT’S THE BOTTOM LINE?

Olive oil was less potent in lowering TC, LDL-C, and TG than other plant oils. This difference was more evident for PUFAs-rich oils, especially n-3 rich ones. However, time was an important variable. The differences in reduction of TC, LDL-C, and TG compared to other plant oils were not evident in interventions with durations higher than 30 days. Olive oil increased HDL-cholesterol to a greater extent than other plant oils, including in studies longer than 30 days.

OTHER REVIEWS


To view our resource database, visit:

www.olivewellnessinstitute.org
A Mediterranean diet reduced the risk of cognitive impairment and dementia, and was associated with improved cognitive functioning.


What is the effect?

- Possible protective effect for Dementia
- Possible protective effect for Cognitive Impairment

To view the full results, visit: olivewellnessinstitute.org

What is the quality of the evidence?

Cognitive function or cognitive decline (e.g. dementia)

- Outcomes measured
- 5 Random controlled trials
- as well as 27 observational studies

KEY RESULTS

DEMENTIA:
6 of 9 studies (2 of 2 cross-sectional and 4 of 7 longitudinal studies found a protective effect, and the other 3 studies did not find a significant association.

COGNITIVE IMPAIRMENT:
7 of 10 studies (3 of 4 cross-sectional, 3 of 5 longitudinal and 1 of 1 RCT) found the Mediterranean diet to be protective, and the other 3 studies did not find a significant association.

NO EFFECT FOR DIASTOLIC BLOOD PRESSURE
(e.g. global cognition and verbal ability): 18 of 23 studies (2 of 3 cross-sectional, 12 of 15 longitudinal and 4 of 5 RCTs) found a significant association for at least one measure, whilst the remaining 5 studies found no significant associations.
A Mediterranean diet may improve cognitive performance and be protective for cognitive impairment and dementia; although the majority of the evidence is observational without adjusting for confounders.

More RCTs and large epidemiological studies adjusted for confounders are needed in order to strengthen the empirical evidence for the role of the Mediterranean Diet in cognitive function, as well as the roles of the individual dietary components.
Health effects of olive oil and the Mediterranean diet

**MENTAL HEALTH**

**DEPRESSION & MENTAL HEALTH**

**EFFECT SIZE**

Any high diet quality, including a Mediterranean diet specifically, was associated with a reduction in the incidence of depressive symptoms, but a causal relationship is not yet established.


**What is the effect?**

To view the full results, visit: olivewellnessinstitute.org

**WHAT IS THE QUALITY OF THE EVIDENCE?**

- **24** different prospective cohorts
- Any dietary pattern or food group
- **29** studies
- Systematic literature and meta-analysis

**KEY RESULTS**

The highest category of adherence to any high quality diet was associated with a lower depression incidence:

**HEALTHY/PRUDENT DIET**

- was associated with a 23% reduced depression incidence (OR = 0.77; 95% CI 0.69, 0.84; P < 0.001)
- (12 studies)

**MEDITERRANEAN DIET**

- was associated with a 25% reduced depression incidence (OR = 0.75; 95% CI 0.67, 0.84; P < 0.001)
- (5 studies)

**PRO-VEGETARIAN DIET**

- was associated with a 22% reduced depression incidence (OR = 0.78; 95% CI 0.64, 0.93; P < 0.001)
- (1 study)

**TUSCAN DIET**

- was associated with a 36% reduced depression incidence (OR = 0.64; 95% CI 0.51, 0.77; P < 0.05)
- (1 study)
WHAT'S THE BOTTOM LINE?

Adherence to high quality diets – regardless whether it was a healthy/prudent, Mediterranean, pro-vegetarian, or Tuscan diet – was associated with a lower incidence of depressive symptoms in a linear, dose-response fashion.

Adherence to a diet with a low inflammatory index was associated with a lower incidence of depression, suggesting that this may be an important mechanism of action. Adherence to low quality diets and food groups was not associated with higher depression incidence. Further research is needed to establish if these relationships are causal.

OTHER REVIEWS


To view our resource database, visit: www.olivewellnessinstitute.org
High olive oil intake was associated with a decreased risk of T2D and improved glucose metabolism in persons with T2D.


**What is the effect?**

- **16% reduced risk of T2D**
- **Improved glycemic control in persons with T2D**

To view the full results, visit: [olivewellnessinstitute.org](http://olivewellnessinstitute.org)

**WHAT IS THE QUALITY OF THE EVIDENCE?**

- 4 prospective cohort studies: Low quality for T2D risk
- 29 Random controlled trials: Moderate quality evidence for T2D risk

**KEY RESULTS**

**T2D RISK:**

- Highest vs. lowest category of olive oil use reduced the risk of T2D by 16%
  
  (RR = 0.84; 95% CI: -0.77 to -0.92; P<0.01) (5 studies)

**GLYCEMIC CONTROL: HBA1C**

- Olive oil resulted in a reduction in HbA1c vs. the control group
  
  (Mean difference = -0.27%; 95% CI: -0.03 to -0.17; P<0.01) (22 studies)

**GLYCEMIC CONTROL: FASTING PLASMA GLUCOSE**

- Olive oil resulted in a reduction in fasting plasma glucose vs. control group
  
  (Mean difference = -0.44mmol/L; 95% CI: -0.66 to -0.22; P<0.01) (25 studies)
WHAT'S THE BOTTOM LINE?

Olive oil reduced T2D risk and improved measures of glycemic control in people with T2D, at clinically significant levels.

Since improvements in these outcomes have previously been described in individuals adhering to a Mediterranean diet, olive oil may be an important mediating factor in this dietary pattern.

WHAT TO KEEP IN MIND?

Limitations

- There was considerable heterogeneity in the trial design, with the number of participants ranging from n=6 to n=215, and the trial length ranging from 2 weeks to 4.1 years.
- The type of olive oil was not always specified.
- There were only a small number of cohort studies available to determine the association with T2D risk (4 studies).

OTHER REVIEWS


To view our resource database, visit:

www.olivewellnessinstitute.org
Evidence from randomised controlled trials shows olive oil exerts beneficial effects on markers of inflammation and endothelial function.


What is the effect?

- No significant effect for TNF-α or Adiponectin
- No significant effect for ICAM-1 or VCAM-1

To view the full results, visit: olivewellnessinstitute.org

WHAT IS THE QUALITY OF THE EVIDENCE?

- Markers of inflammation and endothelial function
- 28 Random controlled trials
- Systematic literature and meta-analysis

KEY RESULTS

The olive oil intervention resulted in:

- **REDUCTION IN CRP**
  Mean difference = -0.64; 95% CI -0.96 to -0.31; P<0.0001 (15 studies)

- **REDUCTION IN IL-6**
  Mean difference = -0.29; 95% CI -0.7 to -0.02; P<0.04 (7 studies)

- **INCREASE IN FMD**
  Mean difference = 0.76; 95% CI 0.27 to 1.24; P<0.002 (8 studies)

- **REDUCTION IN SE-SELECTIN**
  Mean difference = -3.16; 95% CI -4.07 to -2.25; P<0.0001 (2 studies)

Olive Wellness INSTITUTE™
Markers of inflammation (CRP, IL-6) and endothelial function (FMD, sE-Selectin) were improved following interventions with olive oil. These markers are generally regarded to influence CVD risk and may help to explain the cardio-protective associations of olive oil in observational studies.
The Mediterranean diet was inversely associated with metabolic syndrome, although the data are limited and come mostly from cross-sectional studies.


**What is the effect?**

Decreased risk of Metabolic Syndrome with a Mediterranean Diet

To view the full results, visit: olivewellnessinstitute.org

**WHAT IS THE QUALITY OF THE EVIDENCE?**

Occurrence or risk of metabolic syndrome

- Adherence to a Mediterranean diet

12 observational studies

Systematic literature and meta-analysis

**KEY RESULTS**

**METABOLIC SYNDROME:**

The highest adherence to a Mediterranean diet was associated with a 19% decreased risk compared to the lowest adherence (RR: 0.81, 95%CI: 0.71, 0.92) (12 studies).

The protective association was found in both cross-sectional and prospective studies.

**INDIVIDUAL COMPONENTS OF THE METABOLIC SYNDROME**

(4 studies): High adherence to the Mediterranean diet:

- Reduced the risk of high waist circumference (RR = 0.82, 95%CI 0.70, 0.96).
- Reduced the risk of high blood pressure (RR = 0.87, 95%CI 0.77, 0.97).
- Reduced risk of low HDL-C levels (RR = 0.87, 95%CI 0.77, 1.00).
- Null results for triglycerides.
- Null results for blood glucose.
WHAT'S THE BOTTOM LINE?

A Mediterranean dietary pattern was associated with a 19% reduced risk of Metabolic syndrome, but the available evidence is limited, coming mostly from cross-sectional studies.

More research from prospective cohorts and clinical trials are required to better understand the association.

OTHER REVIEWS


To view our resource database, visit:

www.olivewellnessinstitute.org
There was insufficient evidence to support the use of the Mediterranean Diet for the prevention of rheumatoid arthritis, but it may provide some benefit for the progression of rheumatoid arthritis.


**Key Results**

**Risk of Developing Rheumatoid Arthritis:**
No significant association with the Mediterranean diet (2 of 2 studies found no association).

**Progression of Rheumatoid Arthritis:**
Significant improvements in clinical parameters including pain, physical functioning, swelling, inflammatory markers and/or morning stiffness was reported from a Mediterranean diet intervention in 2 of 2 clinical trials over 3 to 6 months.

What is the effect?

- No significant association with risk
- Significant improvement in clinical parameters

To view the full results, visit: olivewellnessinstitute.org

**What is the quality of the evidence?**

- The risk of developing or progression of rheumatoid arthritis:
  - Prospective study / clinical trials
  - 2 clinical trials
  - 2 prospective studies
  - A systematic review
WHAT’S THE BOTTOM LINE?

There is a promise for the Mediterranean diet in reducing the progression of rheumatoid arthritis, but no evidence for a role in reducing its risk. The evidence for both outcomes is limited and more studies are required. Well-designed prospective studies are needed to determine the protective role of a Mediterranean diet in preventing rheumatoid arthritis.

WHAT TO KEEP IN MIND?

Limitations

• Only a small number of studies met the inclusion criteria (4 studies out of 12 full-text articles assessed).
• Both the prospective studies were conducted among Americans, whose general dietary habits differ substantially from a traditional Mediterranean diet, and individuals with the highest adherence score may still not resemble the traditional Mediterranean diet.
• All studies had a moderate to high risk of bias.

OTHER REVIEWS


To view our resource database, visit:

www.olivewellnessinstitute.org
The Mediterranean diet was efficacious for long-term weight loss in overweight or obese individuals compared with low-fat diets, but not compared with other diets (a low carbohydrate diet or the American Diabetes Association diet).


**Weight and Anthropometric Measures**

**What is the effect?**
- Reduction in body weight and BMI
- Reduction in waist circumference

To view the full results, visit: [olivewellnessinstitute.org](http://olivewellnessinstitute.org)

**What is the quality of the evidence?**
- Overweight or obese adults, trying to lose weight
- Mediterranean diet and weight loss over 12 months or more
- 5 Random controlled trials

**Key Results**

A Mediterranean diet at 12 months resulted in:

- **Reduction in body weight =** range of 3.8 to 10.1 kg weight loss vs. pre-intervention. Significant vs. low-fat diet in 3 of 3 RCTs. Not significant vs. other diets in 2 of 2 RCTs.
- **Reduction in BMI =** mean range of -1.0 to -3.3 kg/m2 decrease vs. pre-intervention.
- **Reduction in waist circumference =** mean range of -3.5 to -9.3 cm lost vs. pre-intervention.
WHAT'S THE BOTTOM LINE?

The Mediterranean diet resulted in weight loss and a reduction in BMI and waist circumference over the longer-term in overweight or obese individuals. It was more efficacious than a low fat diet, but not compared to other diets.

OTHER REVIEWS


To view our resource database, visit: www.olivewellnessinstitute.org