ESTUDIO PREDIMED

Papel de la Dieta Mediterránea en la Diabetes y la Obesidad
Evidencias epidemiológicas

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Origin of the Mediterranean Diet
Seven-country study

1) Prevalence of coronary heart disease:
   - United States: 4.6%
   - Finland: 3.4%
   - Italy: 1.1%
   - Greece: 0.5%

2) 10-year mortality due to coronary heart disease:
   - Finland: 45.5 / 10,000
   - United States: 42.4
   - Netherlands: 31.7
   - Italy: 20.3
   - Greece: 6.6
## Incidence of AMI/100,000, 35-64 yr: 1985-94

### Men

<table>
<thead>
<tr>
<th>Country</th>
<th>Incidence</th>
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</thead>
<tbody>
<tr>
<td>FIN-NKA</td>
<td>600</td>
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<tr>
<td>UNK-GLA</td>
<td>800</td>
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<tr>
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<td>POL-WAR</td>
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<td>FIN-TUL</td>
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<td>DEN-GLO</td>
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<td>BEL-CHA</td>
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<td>USA-STA</td>
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<td>GER-AUU</td>
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<td>FRA-STR</td>
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<td>GER-AUR</td>
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<td>ITA-FRI</td>
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<td>FRA-TOU</td>
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<tr>
<td>REGICOR</td>
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<tr>
<td>SPA-CAT</td>
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<td>CHN-BEI</td>
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### Women

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<th>Incidence</th>
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<td>SWE-GOT</td>
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<td>CZE-CZE</td>
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<td>SPA-CAT</td>
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<tr>
<td>REGICOR</td>
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</table>

Factors that explain ↓ CV risk in the countries from the South of Europe

- Genetic factors - improbable
- Life habits - probable
  - Mediterranean diet
  - Physical activity

Evidence-based medicine studies are needed
Cardiovascular disease is the main cause of death at the onset of the XXI Century.
Risk factors of atherosclerosis

Not modifiable
- Age
- Gender
- Genetics

Modifiable
- Lípids
  - cLDL, cHDL, TG
- Hypertension
- Diabetes
- Obesity
- Homocystein
- Habits
  - Smoking
  - Atherogenic diets
  - High alcohol consumption
  - Sedentary
El tratamiento de los factores de riesgo cardiovascular puede retrasar la progresión de la arteriosclerosis y la aparición de sus principales manifestaciones clínicas: los eventos cardiovasculares.
BEST WEAPONS AGAINST CARDIOVASCULAR DISEASE: DIET AND EXERCISE
Dieta Mediterránea
Mediterranean Diet Pyramid Today | Adult population

Each country has its own serving size based on frugality

Wine in moderation & respecting religious & social beliefs

Weekly

Sweets ≤ 2s

Meats ≤ 2s & Processed meat ≤ 1s

Poultry ≤ 2s

Eggs ≤ 2s

Fish/Seafood ≤ 2s

Lentils ≤ 2s

Nuts, Seeds, Olives, ≤ 2s

Herbs, Spices, Garlic, Onions

Variety of flavors

Dairy 2-3s (preferably low fat)

Olive Oil 3-4s

Fruits 1-2 | Vegetables ≥ 2s

Variety of colors / tastes

(Cooked / Raw)

Every Day

bread, Pasta, Rice, Couscous,

and other cereals 1-2s

(preferably whole grain)

Seasonality, Local Products,

Culinary activities

Every Meal

Water

Conviviality,

Regular physical activity

Respose

2010 edition

1 s Serving

high intake

Traditional Mediterranean Diet
Traditional Mediterranean Diet

moderate and low intake

Traditional Mediterranean Diet

Mediterranean Diet Pyramid Today | Adult population

- Weekly
  - Poultry 1-2s
  - Fish/Seafood ≥ 2s
  - Nuts, Seeds, Olives, 1-2s
  - Dairy 2-3s (preferably low fat)
  - Fruits 1-2 | Vegetables ≥ 2s
- Every day
  - Herbs, Spices, Garlic, Onions (less added salt)
  - Olive Oil 3-4s
- Every Main Meal
  - Bread, Pasta, Rice, Couscous, and other cereals 1-2s (preferably whole grain)

Each country has its own serving size based on frugality & respecting religious & social beliefs.

Wine in moderation & respecting religious & social beliefs.

- Sweets ≤ 2s
- Meats ≤ 2s & Processed meat ≤ 1s
- Eggs ≤ 4s
- Legumes ≤ 2s
- Herbs, Spices, Garlic, Onions (less added salt)
- Variety of flavours
- olive oil 3-4s
- Bread, Pasta, Rice, Couscous, and other cereals 1-2s (preferably whole grain)
- Drinking Water
- Seasonality, Local Products, Culinary activities
- Conviviality, Regular physical activity, Response

2010 1 Serving
RISK OF ALL CAUSE MORTALITY ASSOCIATED WITH A TWO-POINT INCREASE IN ADHERENCE SCORE FOR THE MEDITERRANEAN DIET

Sofi, F. et al. BMJ 2008;337:a1344
RISK OF MORTALITY BY CARDIOVASCULAR DISEASES ASSOCIATED WITH A TWO-POINT INCREASE IN THE ADHERENCE SCORE FOR THE MEDITERRANEAN DIET

Study | Relative risk (95% CI) | Weight (%) | Relative risk (95% CI)  
--- | --- | --- | ---  
Trichopoulou et al 2003\textsuperscript{w4} | 5.90 | 5.90 | 0.82 (0.69 to 0.97)  
Knoops et al 2004\textsuperscript{w5} | 14.34 | 14.34 | 0.84 (0.76 to 0.94)  
Mitrou et al 2007 (men)\textsuperscript{w11} | 47.83 | 47.83 | 0.92 (0.89 to 0.96)  
Mitrou et al 2007 (women)\textsuperscript{w11} | 31.93 | 31.93 | 0.93 (0.88 to 0.99)  
Total | 100.00 | 100.00 | 0.91 (0.87 to 0.95)  

Sofi, F. et al. BMJ 2008;337:a1344
MedDiet & CVD
+2 points (0 to 9)

<table>
<thead>
<tr>
<th>Study</th>
<th>Relative risk (95% CI)</th>
<th>Weight (%)</th>
<th>Relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichopoulou (1995) (8)</td>
<td></td>
<td>0.9</td>
<td>0.67 (0.47, 0.95)</td>
</tr>
<tr>
<td>Knoops (2004) (7)</td>
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<td>8.3</td>
<td>0.84 (0.76, 0.94)</td>
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<tr>
<td>Mitrou (2007) (M) (9)</td>
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<td>26.1</td>
<td>0.92 (0.89, 0.96)</td>
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<td>Mitrou (2007) (F) (9)</td>
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<td>17.9</td>
<td>0.93 (0.88, 0.99)</td>
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<tr>
<td>Fung (2009) (CHD) (13)</td>
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<td>19.1</td>
<td>0.87 (0.82, 0.92)</td>
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<tr>
<td>Fung (2009) (Stroke) (13)</td>
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<td>1.8</td>
<td>0.80 (0.62, 1.03)</td>
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<td>Buckland (2009) (15)</td>
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<td>15.6</td>
<td>0.95 (0.88, 1.01)</td>
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<td>Martinez-Gonzalez (2010) (22)</td>
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<td>10.4</td>
<td>0.89 (0.81, 0.97)</td>
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<tr>
<td>Total (95% CI)</td>
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<td>100</td>
<td>0.90 (0.87, 0.93)</td>
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Accruing evidence about benefits of adherence to the Mediterranean diet on health: an updated systematic review and meta-analysis\(^{1,2}\)  
AJCN 2010  
(on-line Sept 1st)

Francesco Sofi, Rosanna Abbate, Gian Franco Gensini, and Alessandro Casini
**Design**

- Randomized clinical trial on the effects of a Mediterranean-style Diet in a sample of 605 patients who had had a myocardial infarction.

**Intervention Groups**

- Mediterranean Diet supplemented with margarine enriched with α-linolenic acid (n= 303)
- Step I Diet of the American Association of Cardiology (n= 302)

**Follow-up**

- 46 months

*(Circulation, 1999; 99: 779-785)*
Figure 1. Cumulative survival without nonfatal myocardial infarction (CO 1) among experimental (Mediterranean group) patients and control subjects.
Effects of the Mediterranean-Style Diet on the Primary Prevention of Cardiovascular Disease (PREDIMED)
Primary specific aims

• To test the effect of a Mediterranean Diet enriched with virgin olive oil on the risk of cardiovascular diseases (a composite endpoint of cardiovascular death, myocardial infarction, and stroke)

• To test the effect of a Mediterranean diet enriched with supplementary nuts (walnuts, almonds, and hazelnuts) on the risk of cardiovascular diseases

• To test the effect of wine intake on the risk of cardiovascular diseases
Other specific aims

• To determine the changes in body weight, blood lipids, blood pressure, markers of inflammation and other intermediate markers of cardiovascular risk to better understand how dietary changes are able to modify the risk of clinical events

• To identify the subjects with certain phenotypic and genotypic characteristics that benefit more from a Mediterranean diet
**PREDIMED TRIAL: DESIGN**

- Men: 55-80 yr
- Women: 60-80 yr
- High CV risk without CVD
- Type 2 diabetics
  - 3+ risk factors

1. Smoking
2. Hypertension
3. ↑ LDL
4. ↓ HDL
5. Overweight/obese
6. Family history

All free of CVD at baseline

Random

- Mediet + Virgin Olive Oil
- Mediet + Nuts
- Control Low-fat
Sample size and Randomization

7,447 participants

Control Low Fat Diet

Mediterranean Diet

n = 2,482

Mediterranean Diet

n = 2,483

n = 2,482
## PREDIMED Participants

<table>
<thead>
<tr>
<th></th>
<th>Mediet + VOO (n= 2487)</th>
<th>MeDiet + Nuts (n=2396)</th>
<th>Control (n=2349)</th>
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<tbody>
<tr>
<td>Age (SD)</td>
<td>67 (6)</td>
<td>67 (6)</td>
<td>67 (6)</td>
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<tr>
<td>Women (%)</td>
<td>57</td>
<td>54</td>
<td>58</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>50</td>
<td>47</td>
<td>48</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td>82</td>
<td>82</td>
<td>84</td>
</tr>
<tr>
<td>Current smokers (%)</td>
<td>14</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Dyslipidemia (%)</td>
<td>72</td>
<td>73</td>
<td>72</td>
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<tr>
<td>BMI, kg/m² (SD)</td>
<td>30 (4)</td>
<td>30 (4)</td>
<td>30 (4)</td>
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<tr>
<td>Waist circumf. (SD)</td>
<td>100 (10)</td>
<td>100 (10)</td>
<td>101 (11)</td>
</tr>
<tr>
<td>Med Diet 0-14 pts. (SD)</td>
<td>8.7 (2)</td>
<td>8.7 (2)</td>
<td>8.3 (2)</td>
</tr>
</tbody>
</table>
PREDIMED: intervention

Introduce changes in the overall food pattern
- Mediterranean diet: 2 groups
  - Total Fat: *ad libitum*
  - High in
    - MUFA *(virgin olive oil)*
    - Fish
    - Fruits, vegetables, legumes
  - Low in *meat & dairy products*
  - alcohol permitted: wine
- Low-fat diet - Control
  - Reduce every fat
  - Increase CHO
- No Energy limitation

**tocolpherols**
**polyphenols**
**flavonoids**
**phytosterols**
PREDIMED INTERVENTION
Strategies for behavior change

- Repeated personal contacts: every 3-mo.
- Group sessions: every 3-mo.
- Holistic approach
  - Written information
  - Self-monitoring
  - Individualized goal-setting
  - Quick feedback
  - Individual motivational interviews (every 3-mo.)
    - adapted to the patient’s features
      - clinical condition
      - preferences
      - beliefs
    - expressed in servings/d to improve understanding
PREDIMED INTERVENTION
Strategies for behavior change

- Additional strategies
  - Seasonal buying lists
  - Menus and recipes
- Only in the 2 MeDiet groups
  - Provision of key food items for free

1 l/week  30 g/day
# Measurements

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<th>2</th>
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<td>General questionnaire</td>
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<td>Follow-up questionnaire</td>
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<td>Physical activity ques.</td>
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<td>Toenail sample</td>
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</table>

* Specific measurements
  * Intervention compliance assessment
Compliance assessment (random sample of 750 subjects)

- Urinary tyrosol and hydroxytyrosol
- Plasma fatty acid composition (oleic and $\alpha$-linolenic acids)
- Total urine polyphenol content
- Resveratrol in urine
- Alcohol in urine
Projected follow-up = 6 years (median)

<table>
<thead>
<tr>
<th>Year</th>
<th>% of recruitment</th>
<th>Cum. %</th>
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<td>2003</td>
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<td>2004</td>
<td>21</td>
<td>30</td>
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<td>2005</td>
<td>28</td>
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<td>2006</td>
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<td>2007</td>
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<td>2008</td>
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<td>2009</td>
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<td>100</td>
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<tr>
<td>Total</td>
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PRIMARY END-POINTS

• Cardiovascular death
• Non-fatal myocardial infarction
• Non-fatal stroke

SECONDARY END-POINTS

• Death from any cause
• Angina leading to revascularization procedure
• Heart failure
• Diabetes
• Cancer
Efectos de la Dieta Mediterránea sobre la Diabetes y la Obesidad
PREDIMED STUDY

3-mo. changes in risk factors

Randomly assigned (n = 772)

Mediterranean-style diet + virgin olive oil (n = 257)
Mediterranean-style diet + mixed nuts (n = 258)
Low-fat diet (AHA guidelines) (n = 257)

Excluded (did not tolerate nuts) (n = 1)
Excluded (n = 2)
Declined follow-up: 1
Breast cancer: 1

Evaluable participants at 3 mo (n = 257)
Evaluable participants at 3 mo (n = 257)
Evaluable participants at 3 mo (n = 255)

PREDIMED TRIAL: 3-mo. changes

- HOMA (x10)
  - MeDiet (+ Virgin Olive oil): p<0.001
  - MeDiet (+ Nuts): p=0.017
  - CONTROL: p<0.001

- Glucose change (mg/dl)
  - MeDiet (+ Virgin Olive oil): p=0.039
  - MeDiet (+ Nuts): p=0.039
  - CONTROL: p<0.001

- Insulin change (pmol/L)
  - MeDiet (+ Virgin Olive oil): p<0.001
  - MeDiet (+ Nuts): p<0.001
  - CONTROL: p<0.001

Selected subjects
(n = 870)

Eligible subjects
(n = 1125)

n = 255 excluded
n = 82 Not meeting inclusion criteria
n = 127 Refused to participate
n = 46 Others reasons

Selected subjects
(n = 870)

n = 452 diabetic subjects

MeDiet + VOO
n = 139

MeDiet + tree nuts
n = 145

Control
n = 134

Year 1

MeDiet + VOO
n = 138

n = 2 death by cancer
n = 1 death from other causes
n = 1 stroke

MeDiet + tree nuts
n = 144

n = 1 death from other causes

Control
n = 131

Year 3

MeDiet + VOO
n = 121

n = 1 acute myocardial infarction
n = 1 death by other causes
n = 1 stroke

MeDiet + tree nuts
n = 132

n = 1 death by cancer

Control
n = 116

Year 6

MeDiet + VOO
n = 29

MeDiet + tree nuts
n = 30

Control
n = 24

n = 1 acute myocardial infarction
n = 1 death by other causes
n = 1 stroke
# Baseline Characteristics of Participants

<table>
<thead>
<tr>
<th></th>
<th>MedDiet + VOO</th>
<th>MedDiet + tree nuts</th>
<th>Control group</th>
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<tbody>
<tr>
<td>n</td>
<td>139</td>
<td>145</td>
<td>134</td>
</tr>
<tr>
<td>Male</td>
<td>55 (40)</td>
<td>68 (47)</td>
<td>51 (38)</td>
</tr>
<tr>
<td>Age - yr</td>
<td>67.4 (6.1)</td>
<td>66.6 (5.8)</td>
<td>67.8 (6.1)</td>
</tr>
<tr>
<td>Body mass index - kg/m²</td>
<td>29.7 (3.3)</td>
<td>29.6 (3.1)</td>
<td>30.0 (3.3)</td>
</tr>
<tr>
<td>Fasting plasma glucose-mmol/l</td>
<td>5.5 (0.8)</td>
<td>5.5 (0.9)</td>
<td>5.5 (0.9)</td>
</tr>
<tr>
<td>HOMA index</td>
<td>1.41 (0.87)</td>
<td>1.34 (0.87)</td>
<td>1.60 (1.17)</td>
</tr>
<tr>
<td>Physical activity Kcal/day</td>
<td>400 (283)</td>
<td>427 (306)</td>
<td>373 (238)</td>
</tr>
<tr>
<td>Current smokers -no. (%)</td>
<td>15 (11)</td>
<td>21 (15)</td>
<td>20 (15)</td>
</tr>
</tbody>
</table>

Median (SD)
### GOALS ATTAINED ACCORDING TO INTERVENTION GROUP

<table>
<thead>
<tr>
<th>MedDiet + VOO</th>
<th>MedDiet + tree nuts</th>
<th>Control group</th>
<th>P-value †</th>
</tr>
</thead>
<tbody>
<tr>
<td>% weight loss ≥ 5%</td>
<td>10.6</td>
<td>9.8</td>
<td>12.8</td>
</tr>
<tr>
<td>Physical activity: % highest baseline tertile</td>
<td>43.9</td>
<td>42.1</td>
<td>32.8</td>
</tr>
<tr>
<td>% 14-point score of MedDiet ≥ 10</td>
<td>61.2</td>
<td>68.3</td>
<td>23.9‡</td>
</tr>
<tr>
<td>% MUFA:SFA Ratio ≥ 2</td>
<td>84.9</td>
<td>83.4</td>
<td>65.7‡</td>
</tr>
<tr>
<td>% Olive oil ≥ 20 g/1000 Kcal/d</td>
<td>86.3</td>
<td>65.5</td>
<td>59.7‡</td>
</tr>
<tr>
<td>% Dietary fiber intake ≥14 g/1000 Kcal/d</td>
<td>10.8</td>
<td>13.1</td>
<td>11.9</td>
</tr>
</tbody>
</table>

Abbreviations: MedDiet, Mediterranean diet; VOO, virgin olive oil; MUFA, monounsaturated fatty acids; SFA, saturated fatty acids

† P values for differences among the three diet groups were calculated by the chi-square test.

‡ The value for the low-fat diet group is significantly different from the value for the two Mediterranean-diet groups (P<0.05).
# CUMULATIVE INCIDENCE OF DIABETES ACCORDING TO INTERVENTION GROUP

<table>
<thead>
<tr>
<th></th>
<th>MedDiet with VOO group (n=139)</th>
<th>MedDiet with nuts group (n=145)</th>
<th>Control diet group (n=134)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person-years, No.</td>
<td>570</td>
<td>598</td>
<td>515</td>
</tr>
<tr>
<td>New cases of diabetes, No.</td>
<td>14</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>Rate per 1000 person-years</td>
<td>24.6 (13.5 to 40.8)</td>
<td>26.8 (15.3 to 43.0)</td>
<td>46.6 (30.1 to 68.5)</td>
</tr>
<tr>
<td>Cumulative incidence (95% CI)</td>
<td>10.1 (5.1 to 15.1)</td>
<td>11.0 (5.9 to 16.1)</td>
<td>17.9 (11.4 to 24.4)</td>
</tr>
</tbody>
</table>
HAZARD RATIOS (95% CONFIDENCE INTERVALS) OF DIABETES ACCORDING TO THE INTERVENTION GROUP

<table>
<thead>
<tr>
<th></th>
<th>MedDiet + VOO vs. control</th>
<th>MedDiet + Tree nuts vs. control</th>
<th>2 MedDiet groups vs. control group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crude</strong></td>
<td>0.53 (0.27-1.90)</td>
<td>0.58 (0.31-1.10)</td>
<td>0.55 (0.32-0.95)</td>
</tr>
<tr>
<td><strong>Age- and sex-adjusted</strong></td>
<td>0.52 (0.27-1.00)</td>
<td>0.55 (0.29-1.00)</td>
<td>0.53 (0.31-0.92)</td>
</tr>
<tr>
<td><strong>Multivariate adjusted</strong></td>
<td>0.49 (0.25-0.97)</td>
<td>0.48 (0.24-0.96)</td>
<td>0.48 (0.27-0.86)</td>
</tr>
</tbody>
</table>

*a Adjusted for sex, age, baseline energy intake, BMI, waist circumference, physical activity (tertiles), smoking, fasting glucose Mediterranean diet score, lipid lowering drugs and weight changes during the study*
CUMULATIVE INCIDENCE OF DIABETES IN THE CONTROL GROUP AND THE INTERVENTION GROUPS DURING 5.5 YEARS

The graph illustrates the cumulative diabetes free-survival for different groups over 5.5 years. The control group (blue line) shows a decrease in cumulative diabetes free-survival starting from 0.88 to 0.82 by the end of the 5.5 years. The MedDiet + VOO group (green line) and the MedDiet + Nuts group (red line) also show a decrease, with the MedDiet + VOO group having a slightly higher cumulative diabetes free-survival compared to the MedDiet + Nuts group.

Statistical significance:
- $P_a$ vs $c = 0.047$
- $P_b$ vs $c = 0.053$

Here, $a$ and $b$ denote the MedDiet + VOO and MedDiet + Nuts groups, respectively, and $c$ denotes the control group.
INCIDENCE OF DIABETES IN THE TWO MED DIET GROUPS POOLED AND THE CONTROL DIET GROUP BY ATTAINMENT OF INTERVENTION GOALS

Dietary MUFA:SFA ratio ≥ 2
Olive oil ≥ 20 g/1000 kcal/d
Nut consumption ≥ 10 g/1000 kcal/d
Dietary fiber intake ≥ 14 g/1000 kcal/d
14-point MedDiet SCORE ≥ 10
Weight loss ≥ 5% of initial body weight
Highest physical activity tertile (>395 kcal/d)
CONCLUSIONES

Los resultados de este sub-estudio del PREDIMED indican que una Dieta Mediterránea ad libitum y alta en grasa no saturada y antioxidantes es una herramienta útil en la prevención de la diabetes.

No obstante, es preciso realizar más estudios para dilucidar los mecanismos de reducción del riesgo de diabetes, independientes de una pérdida de peso.
THE XXI CENTURY EPIDEMIA: OBESITY
Obesity increases the risk of cardiovascular disease

Obesity increases the risk of cardiovascular disease.

Body Mass Index (BMI)

Relative Risk of Death

Men (N=84,376)
Women (N=217,857)

No history of smoking or cardiovascular disease

Calle EE y cols. NEJM 1999; 341:1097-105
Overweight increases the risk of cardiovascular disease

Adaptado de Adams KF. NEJM 2006
### Characteristics of the Participants (n = 3,089)

<table>
<thead>
<tr>
<th></th>
<th>OLIVE OIL (n = 1049)</th>
<th>NUTS (n = 1028)</th>
<th>LOW-FAT (n = 1012)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, mean (SD)</strong></td>
<td>67.0 ± 6.1</td>
<td>66.8 ± 5.9</td>
<td>67.3 ± 6.3</td>
</tr>
<tr>
<td><strong>Gender, N (%) Male</strong></td>
<td>441 (42)</td>
<td>473 (46)</td>
<td>415 (41)</td>
</tr>
<tr>
<td><strong>Family history, N (%)</strong></td>
<td>220 (21)</td>
<td>206 (20)</td>
<td>202 (20)</td>
</tr>
<tr>
<td><strong>Smoking, N (%)</strong></td>
<td>147 (14)</td>
<td>144 (14)</td>
<td>142 (14)</td>
</tr>
<tr>
<td><strong>Diabetes Mellitus, N (%)</strong></td>
<td>514 (49)</td>
<td>483 (47)</td>
<td>486 (48)</td>
</tr>
<tr>
<td><strong>Hypertension, N (%)</strong></td>
<td>850 (81)</td>
<td>822 (80)</td>
<td>840 (83)</td>
</tr>
<tr>
<td><strong>Dyslipidemia, N (%)</strong></td>
<td>724 (69)</td>
<td>720 (70)</td>
<td>698 (69)</td>
</tr>
<tr>
<td><strong>BMI, mean (SD), kg/m2</strong></td>
<td>30.1 ± 3.7</td>
<td>29.7 ± 3.7</td>
<td>30.2 ± 4.1</td>
</tr>
<tr>
<td><strong>Overweight/Obesity, N (%)</strong></td>
<td>976 (93)</td>
<td>936 (91)</td>
<td>931 (92)</td>
</tr>
</tbody>
</table>
## BODY WEIGHT

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>1-year</th>
<th>2-year</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (DE)</td>
<td></td>
</tr>
<tr>
<td>1. Low Fat Diet</td>
<td>76.1 ± 12.0</td>
<td>76.0 ± 12.3</td>
<td>76.0 ± 12.4</td>
<td></td>
</tr>
<tr>
<td>2. MedDiet + Olive Oil</td>
<td>76.5 ± 11.8</td>
<td>75.6 ± 11.8</td>
<td>75.5 ± 12.0</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>vs. 1 &amp; 3</td>
</tr>
<tr>
<td>3. MedDiet + Nuts</td>
<td>76.1 ± 12.0</td>
<td>76.0 ± 12.0</td>
<td>76.0 ± 11.8</td>
<td></td>
</tr>
</tbody>
</table>

Repeated measures analysis of variance:

- **P time** < 0.001
- **P group** = 0.389
- **P interaction** < 0.001
Abdominal fat and myocardial infarction

INTERHEART Study

Importance of the central distribution of fat

Yusuf S et al. Lancet, 2005
## WAIST PERIMETER

<table>
<thead>
<tr>
<th>Diet</th>
<th>Baseline Mean (SD)</th>
<th>1-year Mean (SD)</th>
<th>2-year Mean (SD)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low Fat Diet</td>
<td>99.8 ± 10.5</td>
<td>99.8 ± 10.3</td>
<td>99.9 ± 10.8</td>
<td></td>
</tr>
<tr>
<td>2. MedDiet + Olive Oil</td>
<td>99.8 ± 9.9</td>
<td>98.7 ± 9.8</td>
<td>98.7 ± 10.3</td>
<td>0.001</td>
</tr>
<tr>
<td>3. MedDiet + Nuts</td>
<td>99.6 ± 10.2</td>
<td>99.3 ± 10.3</td>
<td>99.4 ± 10.8</td>
<td></td>
</tr>
</tbody>
</table>

Repeated measures analysis of variance: $P_{time} = 0.010$

$P_{group} = 0.069$

$P_{interaction} < 0.001$
CHANGES IN SERUM ADIPONECTIN

- Oil: P<0.001
- Nuts: P<0.019
- Control: P<0.011
CHANGES IN SERUM LEPTIN LEVELS

**Graph Description:**
- The graph compares serum leptin levels across different groups: Oil, Nuts, and Control.
- The y-axis represents leptin levels in μg/ml, ranging from 3.1 to 4.1.
- The x-axis categorizes the groups: Oil, Nuts, and Control.
- **Oil** group shows a statistical significance of P<0.038.
- **Nuts** group shows a statistical significance of P<0.044.
- **Control** group shows no statistical significance (P=0.968).

**Legend:**
- Orange bar: Leptin 1
- Purple bar: Leptin 3
Overweight and cardiovascular disease

Metabolic syndrome

High LDL-C

Low HDL-C

High Triglyc.

High BP

Diabetes

Cardiovascular Disease

Age

Smoking

Gender

Family His+
## Metabolic Syndrome Status and Its Components at Baseline

<table>
<thead>
<tr>
<th></th>
<th>MedDiet+VOO (n=409)</th>
<th>MedDiet+Nuts (n=411)</th>
<th>Control Diet (n=404)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metabolic syndrome</td>
<td>61.6 (252)</td>
<td>60.6 (249)</td>
<td>61.9 (250)</td>
<td>0.92</td>
</tr>
<tr>
<td>Waist circumference</td>
<td>65.3 (267)</td>
<td>64.5 (265)</td>
<td>69.8 (282)</td>
<td>0.22</td>
</tr>
<tr>
<td>Low level of HDL cholesterol</td>
<td>26.4 (108)</td>
<td>21.2 (87)</td>
<td>24.0 (97)</td>
<td>0.12</td>
</tr>
<tr>
<td>High triglyceride levels</td>
<td>29.8 (122)</td>
<td>29.0 (119)</td>
<td>31.4 (127)</td>
<td>0.74</td>
</tr>
<tr>
<td>High fasting serum glucose</td>
<td>67.5 (276)</td>
<td>66.7 (274)</td>
<td>66.6 (269)</td>
<td>0.96</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>97.1 (397)</td>
<td>95.1 (391)</td>
<td>95.0 (384)</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Percentage (number)

*P* value for comparisons across groups with Pearson’s chi-square test for categorical variables or one-way ANOVA for numerical variables.

Arch Intern Med 2008
BASELINE AND 1-YEAR PREVALENCE OF METABOLIC SYNDROME BY DIET ASSIGNMENT

MedDiet, Mediterranean diet; VOO, virgin olive oil.

Arch Intern Med 2008
The logistic regression model was adjusted for sex, age, and weight changes.

ODDS RATIOS AND 95% CONFIDENCE INTERVALS OF 1-YEAR RESOLUTION (TOP) AND INCIDENCE (BOTTOM) OF THE METS IN THE 2 MED-DIET GROUPS IN COMPARISON WITH THE CONTROL DIET
CONCLUSIONES

1. Nunca es tarde para cambiar los hábitos dietéticos con una mejoría significativa de los marcadores “subrogados” de riesgo vascular.

2. Una Dieta Mediterránea, alta en alimentos ricos en grasa insaturada (aceite de oliva y frutos secos):
   a) Reduce el riesgo de diabetes.
   b) Se acompaña de pérdida de peso y disminución de la circumferencia de la cintura.
   c) Se asocia a una menor prevalencia de síndrome metabólico.
GRACIAS