Examining the relationship between dietary intake and cardiovascular disease in older adults

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Food Matters Live; 22\textsuperscript{nd} November 2016
Proportion of older adults increasing

UK population 65+

2010 10 million

2030 15.5 million

2050 19 million

In 2050, 1/3 of our population will be over 65.
Figure 1.16a Age-standardised death rates from CVD in men and women of all ages, per 100,000, by local authority, United Kingdom 2011/13

Figure 1.16b Deaths by cause in women, United Kingdom 2014

TODAY

435 people will lose their lives to CVD

...more than 110 younger than 75 people will be

7 MILLION people fight their daily battles with CVD

515 people will go to hospital due to a heart attack

190 people will die from a heart attack

12 babies will be diagnosed with a heart defect

CVD STATISTICS – BHF UK FACTSHEET
Current population dietary intakes

**Fruit and vegetables:**
4.1 portions/day (19-64 years)

**Saturated fat:**
exceeded requirements (19-64 years)

**Minerals:**
below requirements in some age groups (particularly 11-18 year olds)

**NMES (sugar):**
intakes exceeded requirements for all age groups

**Total fat:**
met requirements in all age/sex groups except for those over 65 years

**Saturated fat:**
exceeded requirements (19-64 years)

**Oily fish:**
54g/week (19-64 years)

**Vitamins:**
from food were close to/above requirements

**NSP (fibre):**
13.7-13.9g (19 years +)

**Minerals:**
below requirements in some age groups (particularly 11-18 year olds)

**Vitamins:**
from food were close to/above requirements
Talk overview

1) Dietary guidelines to prevent CVD
2) Diet and CVD risk – latest research (Mediterranean diet)
3) Conducting dietary intervention studies
4) Conducting dietary intervention studies in older people
5) Strategies for changing dietary behaviours amongst older adults
The Eatwell Guide

Use the Eatwell Guide to help you get a balance of healthier and more sustainable food. It shows how much of what you eat overall should come from each food group.

- Check the label on packaged foods
  - Energy (kcal): 12.5%
  - Carbohydrates: 38%
  - Protein: 38%
  - Fat: 15%
- Choose wholegrain or higher fibre versions with less added fat, salt and sugars
- Water, lower fat milk, sugar-free drinks including tea and coffee all count.
- Limit fruit juice and/or smoothies to a total of 150ml a day.
- Choose unsaturated oils and use in small amounts

Per day: 2000kcal, 2500kcal = ALL FOOD + ALL DRINKS

Source: Public Health England in association with the Welsh government, Food Standards Scotland and the Food Standards Agency in Northern Ireland

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Healthy eating

A healthy diet can help reduce your risk of developing coronary heart disease and stop you gaining weight, reducing your risk of diabetes and high blood pressure.

A balanced diet

Everyone should aim for a well balanced diet. Faddy crash diets may not provide the balance of nutrients you need.

The best way to understand it is to think of foods in food groups.

Try to eat:

- plenty of fruit and vegetables
- plenty of starchy foods such as bread, rice, potatoes and pasta. Choose wholegrain varieties wherever possible
- some milk and dairy products
- some meat, fish, eggs, beans and other non-dairy sources of protein
- only a small amount of foods and drinks high in fats and/or sugar.

Choose options that are lower in fat, salt and sugar whenever you can.
Meta-analysis of antioxidant supplementation and CHD

**β-carotene**

**Vitamin E**

Vivekananthan et al., 2003
Effect of folic acid supplementation on net change in homocysteine and risk ratio for the primary clinical end point in randomized controlled trials

Pooled net ↓ in homocysteine = 2.9 mol/L, p<0.001
Pooled risk ratio for the primary clinical end point = 1.02, p=0.66
### Table 5. Summary of the Evidence of a Causal Association Between Diet and Coronary Heart Disease, as Determined From Examination of Prospective Cohort Studies Using the Bradford Hill Guidelines and Consistency With Findings From RCTs

<table>
<thead>
<tr>
<th>Evidence of a Causal Association From Cohort Studies</th>
<th>Cohort Data Only</th>
<th>Supported by RCTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>&quot;Mediterranean&quot; diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-quality diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trans-fatty acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glycemic index or load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Prudent&quot; diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Western&quot; diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monounsaturated fatty acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Marine ω-3 fatty acids</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Dietary folate</td>
<td></td>
<td>RCT data only</td>
</tr>
<tr>
<td>Supplementary folate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole grains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary vitamin E</td>
<td></td>
<td></td>
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<tr>
<td>Dietary beta carotene</td>
<td></td>
<td></td>
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<tr>
<td>Supplementary beta carotene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary vitamin C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol, light/moderate consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol, heavy consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weak</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary vitamin E</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Supplementary ascorbic acid</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Total fat</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Saturated fatty acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyunsaturated fatty acids</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>ω-3 fatty acids, total</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure Legend:**

Summary of the Evidence of a Causal Association Between Diet and Coronary Heart Disease, as Determined From Examination of Prospective Cohort Studies Using the Bradford Hill Guidelines and Consistency With Findings From RCTs.
Figure 1. Diet and cardiovascular and metabolic risk—pathways and mechanisms. Each of these dietary factors influences many or even all of these pathways, which could also be modified in some cases by underlying individual characteristics.

Figure 3. Evidence-based dietary priorities for cardiometabolic health. The placement of each food/factor is based on its net effects on cardiometabolic health, across all risk pathways and clinical end points, and the strength of the evidence, as well. For dietary factors not listed (eg, coffee, tea, cocoa), the current evidence remains insufficient to identify these as dietary priorities for either increased or decreased consumption.
What is the Mediterranean diet?
Mediterranean Diet

- MD is primarily made up of:
  - Wholegrains
  - Fruits
  - Vegetables
  - Nuts and seeds
  - Legumes
  - Herbs and spices
  - Olive oil

- Key elements include:
  - Regular consumption of fish and seafood
  - Moderate consumption of poultry, eggs and dairy
  - Moderate consumption of wine
  - Red meat and sweets consumed least often
Risk of mortality from or incidence of cardiovascular diseases associated with two point increase in adherence score for Mediterranean diet

Sofi F et al. Public Health Nutr 2013
Primary endpoint: acute MI, stroke or death from cardiovascular causes

Med diet olive oil HR 0.70 (0.53-0.91); P=0.009

Med diet nuts HR 0.70 (0.53-0.94); P=0.02

Estruch et al., NEJM, 2013
Cumulative survival without nonfatal MI (cardiac death and non-fatal MI) among experimental (Mediterranean group) and control patients

- 302 patients / 303 controls recruited within 6 months of first MI
- given standard dietary advice or detailed “Mediterranean” diet
- more bread, more vegetables, no day without fruit, more fish and less meat, butter and cream replaced by rapeseed-oil based margarine, wine with meals
- 5 year follow up
1.2 Lifestyle changes after an MI

Changing diet

1.2.1 Advise people to eat a Mediterranean-style diet (more bread, fruit, vegetables and fish; less meat; and replace butter and cheese with products based on plant oils). [2007]

1.2.2 Do not routinely recommend eating oily fish for the sole purpose of preventing another MI. If people after an MI choose to consume oily fish, be aware that there is no evidence of harm, and fish may form part of a Mediterranean-style diet. [new 2013]

1.2.3 Do not offer or advise people to use the following to prevent another MI:

- omega-3 fatty acid capsules
- omega-3 fatty acid supplemented foods.

If people choose to take omega-3 fatty acid capsules or eat omega-3 fatty acid supplemented foods, be aware that there is no evidence of harm. [new 2013]

1.2.4 Advise people not to take supplements containing beta-carotene. Do not recommend antioxidant supplements (vitamin E and/or C) or folic acid to reduce cardiovascular risk. [2007]

1.2.5 Offer people an individual consultation to discuss diet, including their current eating habits, and advice on improving their diet. [2007]

1.2.6 Give people consistent dietary advice tailored to their needs. [2007]

1.2.7 Give people healthy eating advice that can be extended to the whole family. [2007]
Conducting dietary intervention studies

*Single nutrient* supplements which can be placebo-controlled are relatively straightforward
Guidelines for the Design, Conduct and Reporting of Human Intervention Studies to Evaluate the Health Benefits of Foods

Robert W. Welch¹, Jean-Michel Antoine², Jean-Louis Berta³, Achim Bub⁴, Jan de Vries⁵, Francisco Guarner⁶, Oliver Hasselwander⁷, Henk Hendriks⁸, Martin Jäkel⁹, Berthold V. Koletzko¹⁰, Chris C. Patterson¹¹, Myriam Richelle¹², Maria Skarp¹³, Stephan Theis¹⁴, Stéphane Vidhy¹⁵ and Jayne V. Woodside

Intervention: selection of control

Blinding

Compliance

Table 1. Factors and recommended standards for human intervention trials evaluating health benefits of foods. Modified from Welch et al. [1]

<table>
<thead>
<tr>
<th>Phase</th>
<th>Factor</th>
<th>Recommended standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Hypothesis</td>
<td>Clear hypothesis</td>
</tr>
<tr>
<td></td>
<td>Study design</td>
<td>Appropriate design</td>
</tr>
<tr>
<td></td>
<td>Duration</td>
<td>Appropriate to design, intervention and outcome measures</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>Test and control foods suitably matched</td>
</tr>
<tr>
<td></td>
<td>Amount</td>
<td>Appropriate to outcome measures and to practical usage</td>
</tr>
<tr>
<td></td>
<td>Outcome assessment</td>
<td>Define primary outcome and method of measurement</td>
</tr>
<tr>
<td></td>
<td>Eligibility criteria</td>
<td>Define all secondary outcomes and methods of measurement</td>
</tr>
<tr>
<td></td>
<td>Statistical considerations</td>
<td>Define all eligibility criteria</td>
</tr>
<tr>
<td></td>
<td>Randomisation</td>
<td>Use randomised design; ensure appropriate allocation, sequence generation and concealment</td>
</tr>
<tr>
<td></td>
<td>Blinding</td>
<td>Ensure double blinding if feasible, single blinding if not</td>
</tr>
<tr>
<td></td>
<td>Size of study</td>
<td>Conduct power calculation based on primary outcome measure</td>
</tr>
<tr>
<td>Conduct</td>
<td>Study protocol</td>
<td>Obtain approval, register trial, comply with Declaration of Helsinki</td>
</tr>
<tr>
<td></td>
<td>Ethical approval and trial registration</td>
<td>Define recruitment strategy and process, including settings and dates</td>
</tr>
<tr>
<td></td>
<td>Recruitment Data collection</td>
<td>Define relevant measures, select suitable methods for assessment, collection and analysis</td>
</tr>
<tr>
<td></td>
<td>– Demographics, lifestyle, background health status and diet, and diet changes</td>
<td>Use suitable methods to record, and respond appropriately</td>
</tr>
<tr>
<td></td>
<td>– Adverse events and unintended effects</td>
<td>Define acceptable level, strive to maximise, assess</td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td></td>
</tr>
<tr>
<td>Analysis and interpretation</td>
<td>Statistical analysis</td>
<td>Devishe appropriate analysis methods, based on study design and outcome measures</td>
</tr>
<tr>
<td></td>
<td>Discussion and interpretation</td>
<td>Consider study limitations and generalisability of findings</td>
</tr>
<tr>
<td></td>
<td>Conclusions</td>
<td>Relate directly to hypothesis, study design, food and participants</td>
</tr>
</tbody>
</table>

Welch et al., 2011; Woodside et al., 2013; Woodside et al., 2015
Design of efficacy studies to test effect of dietary change on ageing outcomes including CVD

<table>
<thead>
<tr>
<th>Design issues</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of intervention</td>
<td>Baseline level of outcome measure</td>
</tr>
<tr>
<td>Outcomes measured (consider likely mechanisms)</td>
<td>Baseline dietary intake</td>
</tr>
<tr>
<td>Control group</td>
<td></td>
</tr>
<tr>
<td>Blinding</td>
<td></td>
</tr>
<tr>
<td>Increase in adherence to be achieved</td>
<td></td>
</tr>
<tr>
<td>How to encourage, monitor and measure compliance</td>
<td></td>
</tr>
<tr>
<td>Monitor other lifestyle behaviours</td>
<td></td>
</tr>
<tr>
<td>Effect of genetic background?</td>
<td></td>
</tr>
</tbody>
</table>
Conducting intervention studies in older people

Studies to encourage behaviour change
Nutrition, ageing and disease

Genes

Environment (including social)

Nutrition

Change in physiological function

Ageing

Disease

Longevity

Treatment

Medication
Deteriorating eyesight can affect:

- Buying food
- Getting to supermarket (inability to drive)
- Reading food labels
- Counting money
- Preparing food
Ageing-related social and emotional considerations

- Whether or not a person lives alone
- How many daily meals are eaten
- Who does shopping and cooking
- Adequate income to purchase appropriate foods
- Alcohol and medication use

ALL of these factors may interfere with appetite or affect ability to purchase, prepare or consume an adequate diet

Need to consider when designing interventions to encourage behaviour change
Strategies for changing dietary behaviours amongst older adults – the TEAM MED study
Peer support to encourage adoption of the Mediterranean diet

- Explore feasibility of peer support as a strategy to encourage adoption of the MD in those at high risk of CVD
- Peer support intervention has developed through direct interaction with the intended target group
TEAM-MED Results – Focus group sample (n=12)

AIM: To explore attitudes to changing diet towards a MD and preferred methods of support for encouraging this dietary change

Participant characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>n=67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>64.0 (10.0)</td>
</tr>
<tr>
<td>Gender n (%)</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>27 (40.3)</td>
</tr>
<tr>
<td>Females</td>
<td>40 (59.7)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.8 (4.5)</td>
</tr>
<tr>
<td>Reported high blood pressure n (%)</td>
<td>45 (67.2)</td>
</tr>
<tr>
<td>Reported high cholesterol n (%)</td>
<td>46 (68.7)</td>
</tr>
<tr>
<td>Current smokers n (%)</td>
<td>8 (11.9)</td>
</tr>
</tbody>
</table>

¹Variables are summarised as mean (SD) or n (%)
Results – Barriers to dietary change

<table>
<thead>
<tr>
<th>Cost</th>
<th>“Who’s going to buy olive oil if you can buy lard, for example, significantly cheaper”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>“Some supermarkets say they have fresh fish but it doesn’t look fresh and when you open it, it stinks”</td>
</tr>
<tr>
<td>Habit</td>
<td>“My generation you just sort of had a very stable diet. Your diet was red meat and potatoes and all that and I have to say that that’s what I was brought up on and that’s what I would eat now”</td>
</tr>
<tr>
<td>Resistance</td>
<td>“If you like the food, enjoy it. My motto is now, I’m coming 70, I’ll eat whatever I want and enjoy it”</td>
</tr>
<tr>
<td>Knowledge</td>
<td>“I haven’t heard of it but I presume the Mediterranean diet is simply the diet that people who live around the Mediterranean eat”</td>
</tr>
<tr>
<td>Time</td>
<td>“With shift working it just depends, maybe coming in late it’s easier to go and get a takeaway then than start to cook”</td>
</tr>
<tr>
<td>Skills</td>
<td>“We all need to eat fruit and vegetables but converting it into something is the problem and going home and preparing it”</td>
</tr>
<tr>
<td>Media</td>
<td>“Nearly everything you touch, one day it’s okay and the next it’s not, and I just decided right, I’m just not going to worry too much”</td>
</tr>
</tbody>
</table>

Awareness - Most people were aware of MD but had limited knowledge of its composition
Peer support intervention

2 peer supporters dedicated to each group
Up to 10 people per group

Community Group programme
Non-directive, interactive and based on discussion

Written education and recipes
Brief educational component
Behaviour change techniques
Social support model

Qualitative work with target group and stakeholders
Evidence reviews

Written education and recipes

Behaviour change techniques
Social support model

Community Group programme
Non-directive, interactive and based on discussion

Written education and recipes
Brief educational component
Behaviour change techniques
Social support model

Qualitative work with target group and stakeholders
Evidence reviews
Peer support to encourage adoption of the Mediterranean diet

Primary endpoint: change in MD score

National Prevention Research Initiative; MRC
Peer support to encourage MD intervention – TEAM-MED EXTEND

• Individual level randomisation involves creation of new peer support groups
• Suggestion that peer support may work best in already established groups
• Funded to carry out similar study in already established community groups (randomised at the group level)
• One year intervention underway

• Dietary interventions in MCI patients
Summary

• Strategies to encourage healthy ageing are increasingly important to global public health
• Diet may be important to reduce CVD risk
• Reasonable observational evidence base for benefits of dietary factors, with accompanying RCT evidence for a Mediterranean Diet
• Careful consideration given to study design when planning future efficacy studies and interventions to promote behaviour change
Acknowledgements

• Dr Claire McEvoy, Dr Sarah Moore, Ms Christina Erwin, Mr Euan Paterson, Dr Charlotte Neville, Ms Andrea McGratten

• Dr Michelle McKinley, Prof Frank Kee, Prof Chris Patterson, Prof Ian Young, Prof Margaret Cupples, Prof Julia Lawton, Prof Lindsay Prior, Prof David McCance, Dr Steven Hunter, Dr Katherine Appleton, Dr Bernadette McGuinness

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