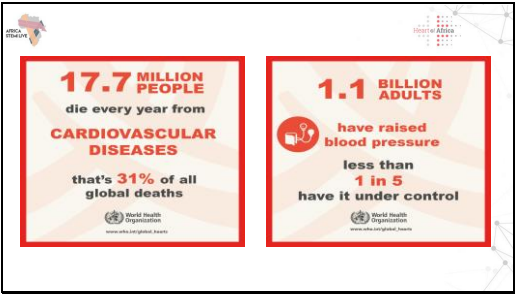


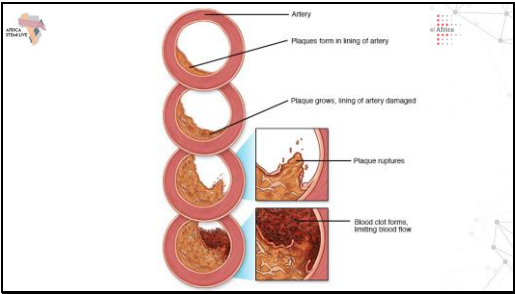
Slide 1





Slide 2



Slide 3

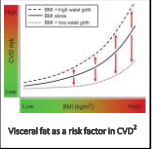


Slide 4



Nutrition: Cardiovascular Disease

- Anti-oxidants including **Vit C** and **Vit E** reduce LDL oxidation¹
- **Low carbohydrate** diets effective in reducing visceral fat vs. low fat diets³
- **Garlic** = Hypolipidemic⁴, increases blood anti-oxidation and reduces blood pressure⁵



Visceral fat as a risk factor in CVD²

1. Kanner and Rudolph. The effect of ascorbic acid and alpha-tocopherol on the oxidation of low-density lipoprotein. *Circulation* 1994; 89: 1001-1006.




2. Björkelund et al. The relationship between visceral fat and the metabolic syndrome in middle-aged men. *European Heart Journal* 2004; 25: 104-109.

3. Björkelund et al. The relationship between visceral fat and the metabolic syndrome in middle-aged men. *European Heart Journal* 2004; 25: 104-109.

4. Björkelund et al. The relationship between visceral fat and the metabolic syndrome in middle-aged men. *European Heart Journal* 2004; 25: 104-109.

5. Björkelund et al. The relationship between visceral fat and the metabolic syndrome in middle-aged men. *European Heart Journal* 2004; 25: 104-109.

Slide 5





Eating a diet lacking in healthy foods and/or high in unhealthy food was linked to more than **400,000 deaths from heart and blood vessel diseases in 2015**


Another Researcher team from Tufts University in Boston, the University of Cambridge in England and Montefiore Medical Center in New York analyzed data from the National Health and Nutrition Examination Survey.

Their analysis showed that about **45 percent of the deaths were linked to unhealthy eating habits**

Slide 6



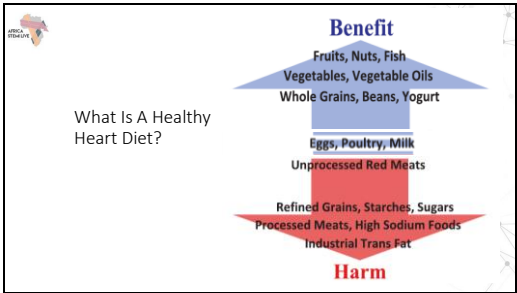
The Connection Between Diet And Cardiovascular Disease



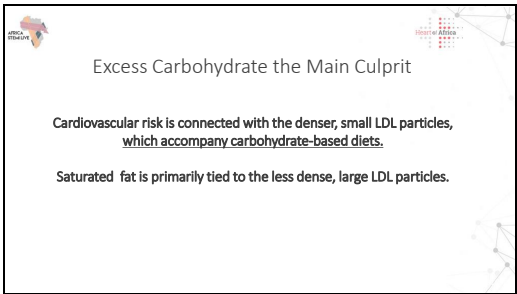
Diet directly affects the development of atherosclerosis (lesions which can block arteries), the underlying cause for CVD.

Diet also affects blood cholesterol levels, body weight, blood pressure and blood glucose levels.

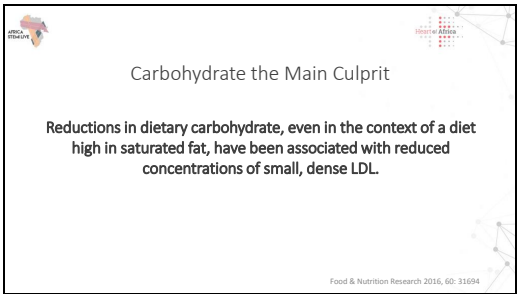
Slide 7



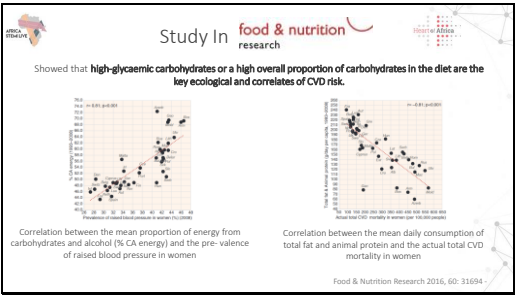
Slide 8



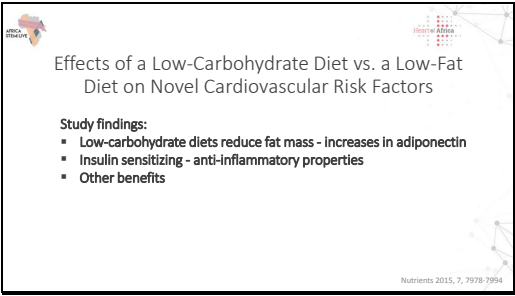
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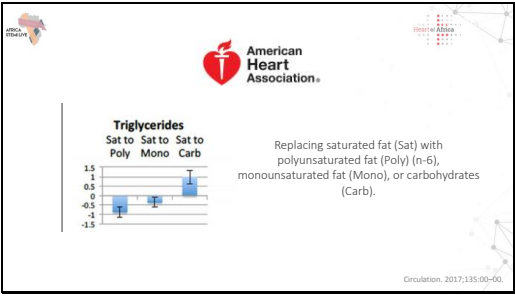
Slide 10





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Slide 12





Slide 13



Some fats are good, some fats may be neutral but it is carbohydrate that is the worst thing.

It is time for guideline committees to shift focus away from salt, fats and focus greater attention to the likely more-consequential food additive: sugar.

Slide 14



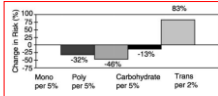
Fats and Oils

Limit trans fat:

- Trans fat are found in some fried foods, and packed foods made with hydrogenated oils.

Eat more PUFA & MUFA (heart healthy fats):

- Good choice include salmon, tuna, mackerel and sardines.
- Other foods include walnuts, canola, soybean oils, almonds, cashews and hazelnuts.




Replacement	Change in CHD risk
Mono per 5%	-32%
Poly per 5%	-46%
Carbohydrate per 5%	-12%
Trans per 2%	89%


Change in CHD risk associated with replacement of saturated by other fats: Nurses Health Study

Food & Nutrition Research 2016; 60: 31694

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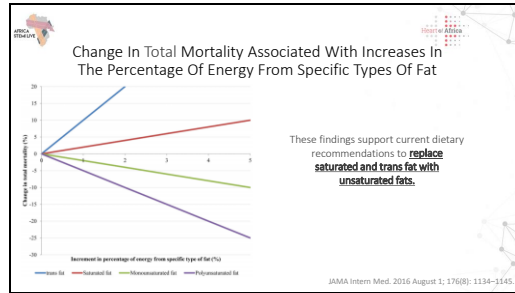
Study in



Trans fats are associated with all cause mortality, total CHD, and CHD mortality.

BMJ 2015;351:h2978

Slide 16



Slide 17

Evidence

Meta-analysis suggests that dietary **intake of n-3 polyunsaturated fatty acids reduces overall mortality, mortality due to myocardial infarction, and sudden death in patients with coronary heart disease.**

Ann Intern Med. 2002 Mar;132(4):298-304.

Circulating individual and total n3-PUFA are associated with lower total mortality, especially CHD death, in older adults.

Ann Intern Med. 2013 April 2; 158(7): 515-525.

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Dietary Fiber

Different fiber types may have specific benefits:

- Insoluble fiber** (found in wheat bran, whole grains, seeds, nuts, legumes, fruits and vegetables) help achieve weight loss.

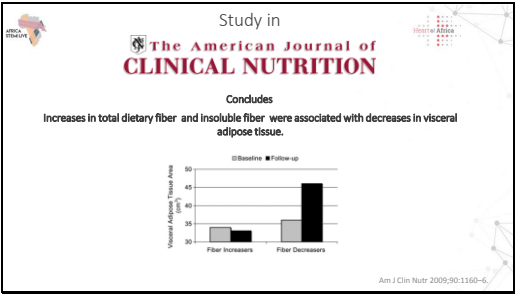
Consuming whole grains on a regular basis lower the risk for heart disease and heart failure.

- Soluble fiber** (found in dried beans, oat bran, barley, apples, and citrus fruits) help achieve healthy cholesterol levels and reduce blood pressure.

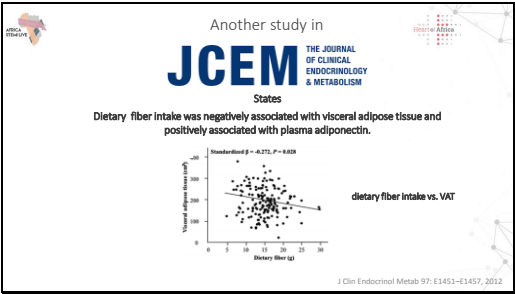
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Slide 21



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Important amino acids

- Study shows people who eat high levels of certain amino acids found in meat and plant-based protein have lower blood pressure and arterial stiffness.
- Researchers investigated the effect of seven amino acids on cardiovascular health among almost 2,000 women with a healthy BMI
- Strong evidence to suggest those who consumed the highest amounts of animal foods had lower measures of blood pressure and arterial stiffness.
- Food source was important:
 - higher intake of amino acids from **plant-based sources** associated with **lower blood pressure**
 - higher intake from **animal sources** associated with lower levels of **arterial stiffness**
- *Arginine · cysteine · glutamic acid · glycine · histidine · leucine · tyrosine*

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Proteins in cardiovascular health



- Replacing high-fat meats with proteins like fish, beans, poultry, nuts, and low-fat dairy → can help lower cholesterol and blood pressure
- Sensible proteins instead of high-fat meat options can reduce your risk of heart attack and stroke
- High levels of red meat intake increase your risk for coronary heart disease.
- Eating more fish and nuts is associated with significantly lower risk.
- **One serving** per day of nuts was associated with a **30 percent** lower risk of heart disease than one serving per day of red meat.
- **One daily serving** of fish had a **24 percent lower risk**, while poultry and low-fat dairy also were associated with lower risk, at 19 percent and 13 percent, respectively.

Slide 24

The diagram illustrates the oxidation of LDL by free radicals in the presence of antioxidants. It shows a macrophage engulfing oxidized LDL (foam cell) and the role of antioxidants in preventing this process.

- Top Left:** A small inset shows a map of Africa with the text "Africa 2016".
- Top Right:** A small inset shows a molecular structure of a lipid with the text "100% of Antioxidant".
- Text:**
 - Antioxidant Vitamins
 - The oxidation of LDL by free radicals results in the unregulated uptake of modified LDL by macrophages in arterial walls, accelerating the atherosclerotic process. Anti-oxidant nutrients, which can directly scavenge free radicals, include α -tocopherol (vitamin E isomer), ascorbic acid (vitamin C) and β -carotene.
- Diagram:**
 - Left:** A macrophage is shown with a red dot labeled "Native LDL" and a red arrow pointing to it labeled "Difficult to penetrate".
 - Center:** A macrophage is shown with a yellow dot labeled "Oxidized LDL" and a yellow arrow pointing to it labeled "Only to penetrate when it is oxidized LDL".
 - Right:** A macrophage is shown with a yellow dot labeled "Oxidized LDL" and a yellow arrow pointing to it labeled "Only to penetrate when it is oxidized LDL".
 - Bottom:** A cross-section of an artery wall is shown with a red arrow pointing to it labeled "Atherosclerotic process".

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Antioxidant Vitamins

Vitamin E : a fat soluble vitamin present in nuts, seeds, vegetable and fish oils, whole grains (esp. wheat germ), fortified cereals and apricots.

Vitamin C : a water soluble vitamin present in citrus fruits and juices, green peppers, cabbage, spinach, broccoli, kale, cantaloupe, kiwi and strawberries.

Vitamin C intake is inversely associated with mortality from total stroke, coronary heart disease, and total cardiovascular disease.

Beta-carotene is present in liver, egg yolk, milk, butter, spinach, carrots, squash, broccoli, yams, tomato, cantaloupe, peaches and grains.

Vitamin K : a fat soluble vitamin present in spinach, Brussels sprouts, broccoli, cauliflower and Fish. Prevents vascular calcification.

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Homocysteine Level

- → Higher homocysteine levels are cytotoxic & found in up to 40% vascular disease patients
- → Higher homocysteine level is an independent risk factor for
 - ✓ Atherosclerosis
 - ✓ Ischemic Heart Disease
 - ✓ Stroke
 - ✓ Venous thrombosis
- → Role of B Vitamins

Slide 27



```

graph TD
    AI[Arginase Inhibitors] --> B1[Block conversion of L-arginine to L-ornithine and NO by Arginase]
    B1 --> ADMA[↑ ADMA*]
    B1 --> NO[Impair release / inactivation of NO]
    ADMA --> ILA[Inhibitor of L-arginine]
    ILA --> ECD[Endothelial cell dysfunction & ↑ Oxidative stress]
    NO --> DEVD[↓ endothelial dependant Vasodilation]
    ECD --> DEVD
    DEVD --> CC[↑ cardiovascular complications]
    
```

* Asymmetrical dimethylarginine

(European Journal of Endocrinology 2004; 151: 483-490)



Slide 28



Clinical Evidence

- B9, B6 & B12 combination **reduces upto 50% circulating homocysteine levels.**
- B9 **prevents homocysteine induced oxidative stress** hence protects against endothelial injury.
- B9, B6 & B12 combination **reduces intima media thickness**, a marker of atherosclerosis.
- B9, B6 & B12 combination **reduces the risk of ischemic or haemorrhagic stroke.**



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Food source


- Good sources of **vitamin B6** include fortified cereals, beans, poultry, fish, and some vegetables and fruits, especially dark leafy greens, papayas, oranges
- **Vitamin B12** is found naturally in animal products (such as fish, poultry, meat, eggs, or dairy); it is also found in fortified breakfast cereals and enriched soy or rice milk.
- Excellent sources of **folate**—fruits and vegetables, whole grains, beans, breakfast cereals

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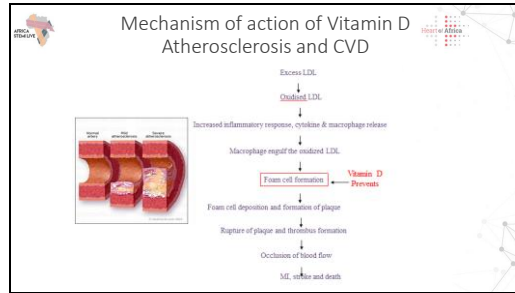


Vitamin D

- Suppress renin gene expression & prevents hypertension
- Prevents atherosclerosis by preventing foam cell formation.
- Prevents arterial calcification



Slide 31



Slide 32

Sodium

Misconception

Guidelines have recommended significant reductions in dietary sodium intake to improve cardiovascular health.

However, these dietary sodium intake recommendations have been questioned as emerging evidence has shown that there is a higher risk of cardiovascular disease with a low sodium diet, including in individuals with type 2 diabetes.

Front. Endocrinol. 7:164.

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Dietary Sodium Restriction

- Adversely affect glucose metabolism and decrease insulin sensitivity.
- Activates the renin-angiotensin-aldosterone system and sympathetic nervous system
- Increase LDL level

↑

Cardiovascular disease

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Evidence

Studies demonstrated that **total cholesterol and low density lipoprotein cholesterol increased significantly with short-term low sodium intake** (20 mmol/24 h for 1 week) in non-obese normotensive individuals aged 19–78 years old and in healthy men

Graudal et al. observed **increased total cholesterol and low density lipoprotein cholesterol levels** without changes in high-density lipoprotein cholesterol and triglycerides mainly **in studies with short-term large reductions in sodium intake**.

Front. Endocrinol. 7:164.

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Calcium

Calcium stabilizes vascular cell membranes, inhibits its own entry into cells, and reduces vasoconstriction.

Calcium works in combination with other ions such as sodium, potassium, and magnesium to provide an ionic balance to the vascular membrane, vasodilatation, and resulting reduced BP.

J Clin Hypertens (Greenwich). 2008;10(7 suppl 2):3–11.

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Magnesium

Low magnesium states lead to insufficient amounts of prostaglandin E1, causing vasoconstriction and increased BP

Magnesium regulates intracellular calcium, sodium, potassium, and pH as well as left ventricular mass, insulin sensitivity, and arterial compliance.

Magnesium is more effective in reducing BP when administered in a natural form as a combination of magnesium, potassium, and calcium than when given alone.



J Clin Hypertens (Greenwich). 2008;10(7 suppl 2):3–11.

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L-Carnitine

- L-carnitine is a water-soluble amino acid-like compound found in foods such as lamb, beef, red meat, and pork.
- Your body also endogenously produces L-carnitine with the help of two amino acids – lysine and methionine – as well as Vitamins C and B6, iron, and niacin.
- In order to avoid L-carnitine deficiency, vegetarians should supplement and/or combine such foods as beans and rice, which contain lysine and methionine, respectively.
- L-carnitine is also considered an antioxidant that protects your heart and blood vessels from oxidative stress that can lead to Coronary Artery Disease.
- A study showed that compared with placebo or a control, L-carnitine is associated with a 27% reduction in all-cause mortality, a 65% reduction in ventricular arrhythmias and a 40% reduction in angina symptoms in patients experiencing an acute myocardial infarction.

James J. DiMichele et al., L-Carnitine in the Secondary Prevention of Cardiovascular Disease: Systematic Review and Meta-analysis

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Plant sterols

Plant sterols and stanols (phytosterols) are found naturally in plants and are structurally similar to cholesterol.

When adequate amounts of sterols are consumed in diet, they interfere or block the absorption of cholesterol. This results in lower blood cholesterol levels, which is a risk factor for heart disease.

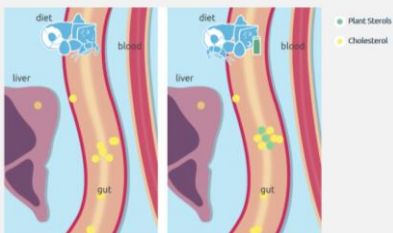
Plant sterol and stanols reduce the absorption of cholesterol from the gut by **30 to 40%**

Slide 42





Without Plant Sterols and Stanols

With Plant Sterols and Stanols





- Plant Sterols
- Cholesterol

Slide 43



- **Garlic** = Hypolipidemic, increases blood anti-oxidation and reduces blood pressure
- **Co-enzyme Q10** decreases blood pressure in CAD patients
- **Ginkgo Biloba** induces vasodilation in CAD patients

Slide 44





Dietary Source

- **Magnesium** Present in spinach, legumes, nuts, seeds, and whole grains. Studies suggest that magnesium supplements cause significant reductions in blood pressure. The recommended daily allowance of magnesium is 320 mg.
- **Calcium** regulates the tone of the smooth muscles lining blood vessels.
- **Potassium** rich foods include bananas, oranges, dried peas and beans, nuts, potatoes, and avocados. A potassium-rich diet provide reduction in blood pressure.

Caution : For those using potassium-sparing diuretics (such as spironolactone), or have chronic kidney problems, potassium supplements should be taken with caution.

Public Health Nutrition: 7(1A), 167-186

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Lifestyle Modification

- Diet
- Physical activity
- Stress & anxiety control

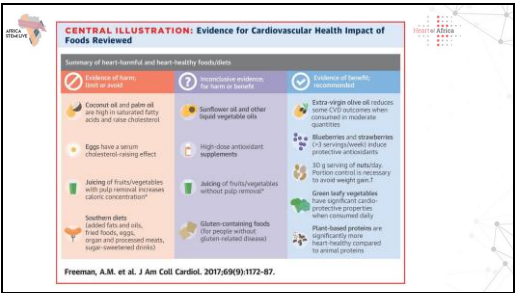
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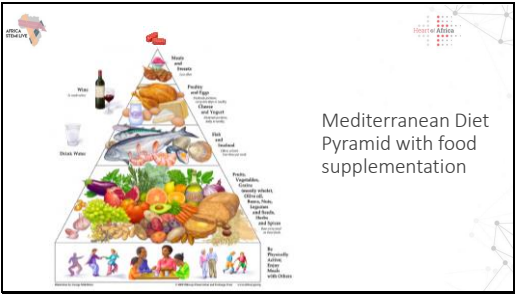


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Supplements

Supplements can be in the form of tablets, capsules, liquids, effervescent tablets and drinks.

They are composed of nutrients such as vitamins, minerals, and sometimes other extracts which provide certain benefits.


There are a wide variety of vitamins and minerals that should be consumed daily, and it's very difficult to know if your diet includes all of these.

Taking a supplement safe guards these levels, as trying to achieve this through food alone would mean a vast amount of food will need to be consumed with the levels being unknown.

It is easier, safer and more secure incorporating a supplement into your diet so you know you are getting support throughout your daily life.

Micronutrients can have an impact on gene expression too.


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Supplements

The reasons why we should use supplements in addition to a balanced diet are

- Soil depletion
- Water depletion
- Low cal diets
- Non organic foods
- Grain fed meat as opposed to grass fed meat
- Toxin exposure
- Reduction of nutrient absorption with age
- Hectic lifestyle

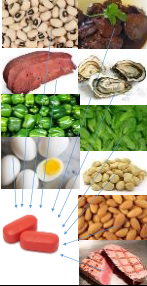


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Food Sources

▪ Iron	100g Chicken Livers	→ 12mg
▪ Zinc	3 Oysters	→ 15mg
▪ Magnesium	100g Spinach	→ 75mg
▪ Thiamin	140g Macadamia Nuts	→ 10mg
▪ Riboflavin	500g Almonds	→ 5mg
▪ Niacin	100g Cooked Yellowfin Tuna	→ 20mg
▪ Folic Acid	200g Cooked Black Eyed Peas	→ 4000ug
▪ Vitamin B12	12g Beef Liver	→ 10ug
▪ Vitamin C	One small green bell pepper 24g	→ 60mg
▪ Vitamin D	3 hard boiled eggs	→ 10ug



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PREDIMED (Prevención con Dieta Mediterránea) Study

People: 7447 adults at risk of heart disease

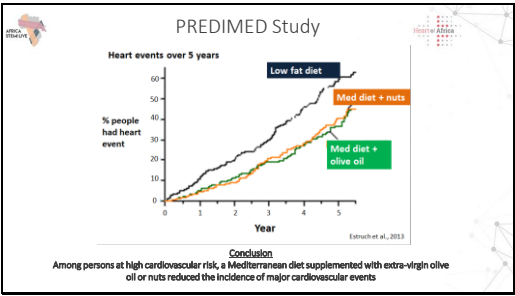
Groups: Med diet and olive oil
Med diet and nuts
Low fat diet

• **Outcome:** Heart related death, heart attack, stroke or diabetes

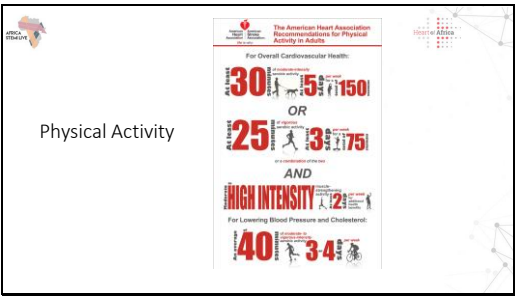
• **Duration:** 5 years



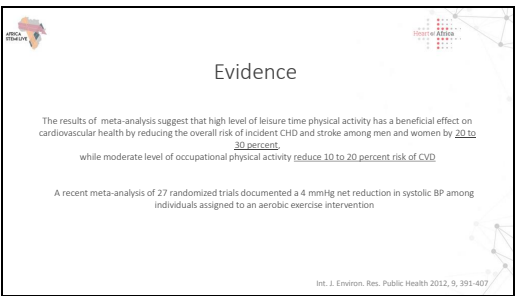
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Stress and Anxiety Control

- Chronic stress, both at early life and adulthood, has been associated with ~40–60% excess risk of CHD.
- Meditation in one study reduce SBP and DBP by 10.7 mm Hg and 6.4 mm Hg over a period of 3 months
- Progressive muscle relaxation lower SBP by 4.7 mm Hg and DBP by 3.3mm Hg.
- Yoga is also widely believed to reduce blood pressure

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Stress and CNS management via vitamin therapy



Stress

- 'Modern epidemic'
- Hypercortisolemia associated with CVD

Insomnia

- Associated with obesity, CVD, diabetes, anxiety and depression
- Reduced leptin, increased ghrelin and increased BMI

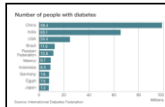
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Global burden: Type 2 Diabetes

- Diabetes affects **422 million** worldwide¹
- 7.5 million new cases per year
- Global costs **\$825 billion**²
- 2-4x increased risk of CVD

Number of people with diabetes



Region	Number of people with diabetes (millions)
North America	~35
Europe	~30
Asia	~25
South America	~15
Africa	~10
Oceania	~5
Middle East	~5
Central America	~5
Caribbean	~5
South Asia	~5
East Asia	~5
SE Asia	~5
SW Asia	~5
Central Asia	~5
North Africa	~5
Sub-Saharan Africa	~5
East Africa	~5
West Africa	~5
Central Africa	~5
South Africa	~5
Other	~5

1. Global report on diabetes, World Health Organization, Geneva, 2016

2. ADA Task Force on Diabetes Economics, International Diabetes Federation, Brussels, 2016

3. International Diabetes Federation

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Nutrition: Type 2 Diabetes

- Chromium increases insulin sensitivity¹
 - In conjunction with lifestyle guidance
- Magnesium reduces insulin resistance²
- High fibre diet and exercise improves glycaemic control³
 - 71% of hypoglycaemic agent users discontinued use
 - 39% of insulin users discontinued use

Reduction in Fasting Glucose Levels

Group	Pre-Prandial	Post-Prandial
Control	~10	~15
Chromium	~25	~35

1. Fajó-Vega, M. et al. Biochemical effect of oral chromium picolinate supplementation on glycemic control in patients with type 2 diabetes: a randomized controlled study. "Thrombosis Research" 2015, 155, 161-165.

2. Kozianka, M. et al. Oral magnesium supplementation improves insulin resistance in all subjects with type 2 diabetes: effect of glucose variability. "Diabetes Care" 2015, 38(12), 1932-1938.

3. Mozaffarian, D. et al. Dietary fiber and blood pressure: meta-analysis. "JAMA" 2005, 293(14), 1868-1873.

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Nutrition: Type 2 Diabetes

- Bilberry Extract contains polyphenols that regulate carbohydrate metabolism¹
- Antioxidants
 - Vit C
 - Vit E²
 - Carotenoids²
 - Selenium³

Free radical production and anti-oxidant action

1. Mozaffarian, D. et al. Bilberry extract improves glycemic control in patients with type 2 diabetes: a randomized controlled study. "Thrombosis Research" 2015, 155, 161-165.

2. Kozianka, M. et al. Oral magnesium supplementation improves insulin resistance in all subjects with type 2 diabetes: effect of glucose variability. "Diabetes Care" 2015, 38(12), 1932-1938.

3. Mozaffarian, D. et al. Dietary fiber and blood pressure: meta-analysis. "JAMA" 2005, 293(14), 1868-1873.

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Obesity

Under weight	Normal weight	Over weight	Obese (Class I)	Obese (Class II)	Obese (Class III)
<18.5	18.5 – 24.9	25.0 – 29.9	30.0 – 34.9	35.0 – 39.9	>40.0

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