Plant based diets and cardiovascular health

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Disclosure slide

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Coronary Artery Disease

- Involves atherosclerotic plaque formation.
- Decreased oxygen delivery to myocardium and due to impairment in blood flow.
- Demand/supply mismatch
- Major cause of death in the USA and worldwide
Clinical atherosclerosis = end result of a disease that develops slowly over many decades

Often a silent asymptomatic disease until it suddenly presents as a MI, chronic ischemia, or claudication.

Sudden plaque rupture can be fatal 1/3 of the time

The PDAY study:
- atherosclerosis begins in childhood
- young adults often have “significant lesions"
- even at a young age the development of atherosclerosis is associated with risk factors hyperlipidemia, tobacco, obesity, abdominal fat, DM, HTN

Fetal and ped path 2002;21:213-217
Multifactorial Phenomenon

- Non-modifiable
  - Gender, age, family history, genetics
- Modifiable
  - Smoking, obesity, lipid levels, psychosocial variables

- Fast past lifestyle/western world
  - Higher incidence of fast food
  - Higher prevalence of ischemic heart disease

- Hypercholesterolemia is an important modifiable risk factor.
- Higher LDL
  - Higher risk for CAD
  - A higher HDL decreased risk for HDL
Over 90% of risk in men and 94% risk in women could be attributed to nine risk factors (p=0.0001):

- Smoking
- Raised ratio of apo B to apo A-1 (LDL-c to HDL-c)
- HTN
- Diabetes
- Abdominal obesity
- Adverse psycho-social risk factors

Dyslipidemia - responsible for more than 50% of the population attributable vascular risk

Epidemiology

- Cardiovascular disease is the leading cause of death in the United States
- U.S obesity prevalence was 41.9% in 2017-march 2020 (NHANES, 2021).
- Between 2018-2019- 251 billion dollars spent in direct costs and $155.9 billion in lost productivity/mortality

Saturated fatty acids may interact with the gut microbiome to promote translocation of lipopolysaccharide = potent pro-inflammatory endotoxin into blood stream.

High unsaturated fat and low saturated fat = anti-inflammatory effects, insulin sensitivity and reduction of CVD.
Animal Foods

- Increased cardiovascular endpoints
- 24% lower mortality of CHD in vegetarians relative to omnivores
- Heme iron found in animal foods (red meat, poultry, and seafood) = an increased risk of cardiovascular disease and insulin resistance
- Postulated that oxidative potential of iron = reactive oxygen species and oxidative stress could be the cause
- Sodium, nitrates and nitrites used to preserve meats may also increase cardiovascular outcomes through increased BP, impaired insulin response and endothelial dysfunction

What about lean meat?

- RCT compared the effects of white meat, red meat and nonmeat protein sources on atherogenic lipoprotein measures
- Study used generally healthy men/women 21-65 y/o randomized to either high SFA/low SFA and within each to red meat, white meat, or nonmeat protein sources consumed for 4 weeks
- LDL-c and ApoB were higher with red and white meat than with nonmeat independent of saturated FA content
- No significant difference between red and white meat
- NO evidence for choosing white > red meat for CVD prevention!!!
What is a plant based diet?

- Fruits
- Vegetables
- Legumes (beans, lentils, and peas)
- Tofu/tempeh
- Whole grains
- Yams
- Nuts/seeds
- Plant oils (ie EVOO)
- Minimal processed plant based foods
Plant foods are rich in polyphenols

- Natural bioactive compounds produced by plants
- 4 major classes
  - Flavonoids, lignans, phenolic acid, and stilbenes
- Anti-oxidants, protective against oxidative stress which can improve CVH by reducing platelet aggregation, vascular inflammation, modulating apoptotic processes, limiting LDL oxidation, and improving lipid profile
- Plant based diet high in vitamin C, E, beta-carotene, and potassium = reduces blood pressure and lowers stroke risk
Plant-Based Diets

- Wide diversity of plant-based diets
- Study looked at healthful plant-based index which positively weights plant foods, and negatively weights less healthy foods
Key nutrients on a plant-based diet

- **Iron, zinc, iodine, calcium** → nutrient deficiencies do not occur more in plant-based diets compared to other diets

- **Vitamin B-12** → found in fortified foods although supplementation is recommended especially in patients taking metformin

- **Protein** → consuming more animal protein may increase risk for type 2 diabetes compared to vegetable protein sources → legumes, whole grains, tofu, tempeh, pea protein, nuts and seeds.

- **Omega-3 fatty acids** → found in seeds (hemp, chia, flax), walnuts, leafy green, vegetables, microalgae, soybeans → lower in omega-6 FA → more ideal ratio to omega-3 fatty acids
Healthy vs. Unhealthy plant based diets

Diet with whole grains, vegetables, fiber, fruit, and non-hydrogenated vegetable oils. This diet improves cardiovascular health by:

- Low in energy density due to low saturated fat and high fiber content
- High fiber content = weight loss management = gastric distension triggering satiety and delayed gastric emptying, prolonged nutrient absorption promoting satiety
- Meta analysis of RCT found 2-10 g/day increase in soluble fiber decreased LDL cholesterol likely due to lower cholesterol, fat absorption, altered cholesterol synthesis, increased bile acid synthesis and decreased bile acid absorption
Comparing effectiveness of plant based diets

Fig. 2. Percent weight loss (±SE) during 6-mo New DIET’s trial by diet group. New DIET, New Dietary Interventions to Enhance the Treatments. *P trend < 0.01.

Hypertension

- Plant based diet or plant predominant diet such as DASH or vegetarian diet, may lower both systolic and diastolic BP by:
  - Favorably modifying RASS and sympathetic nervous system
  - Greater potassium and decreased sodium consumption
  - Improved blood vessel dilatation
  - Changes in baroreceptors

- **Diet approach to stop hypertension (DASH) diet**
  - In trial participants with a baseline SBP >150 mmHg
  - 11.4 mm Hg reduction in BP
  - DASH- low NA: 20.8 mmHg reduction in BP
Plant based diets improve glycemic control and body weight.

Improved nerve function in patients with diabetic neuropathy.

Highly motivating for patients due to improvements in glycemic control. Weight loss and enhanced quality of life.

Vegan and vegetarian diets are nutritionally adequate and may provide health benefits for the prevention and treatment of type 2 diabetes mellitus with the exception of b-12.

Metformin increases further risk for b12 deficiency --> supplement!

How do I go plant-based?

- Assess patients readiness for change
- Don’t know where to begin? → recipes.heart.org → select vegetarian options!
- www.nutrition.va.gov → grocery list (vegetables, beans/legumes, fruit, whole grains, nuts/seeds, protein source, healthy snacks)
- Refer to a registered dietitian if possible!
  - Eatright.org to find a local RD
  - Nutrimedy.com for teledietetics
- Financial stress? Frozen vegetables/fruits provide the same nutrient content as fresh vegetables/fruits
Prevention starts today!

- Nutrition
- Exercise
- Stress reduction
- Psychosocial relationships