Diets & Cardiovascular Disease: An Evidence-based Assessment

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DISCLOSURES

No potential conflicts related to this presentation
“Good nutrition is essential. The problem is we still don’t know what to eat.”

J. Willis Hurst
Notes from a Chairman
1987
RECIPE FOR OPTIMAL CV HEALTH?

Evidence?
Obesity Epidemic Despite Low-Fat Recommendations

- **AHA Dietary Guidelines**
  - 30% calories from fat (<10% saturated)
  - 55% carbohydrates
  - 15% protein
  - ≤ 300 mg chol per day

- **Obesity In the US (BMI ≥ 30)**
  - > 30% of population

- **Obesity Worldwide**
  - One Billion Overweight (BMI ≥ 25)
  - 300 Million Obese

World Health Organization
Prevalence of Obesity in U.S. Adults

1991

1996

2006

2008

Percentage of State Obese (BMI ≥ 30)

No Data  <10%  10–14%  15–19%  20–24%  25–29%  >30%

CDC Overweight and Obesity
Diabetes currently affects 246 million people worldwide
It is expected to affect 380 million by 2025

1Adapted from IDF. E-Atlas. Available at: www.eatlas.idf.org (accessed 05.03.07).
PREVALENCE OF METABOLIC SYNDROME / LIFETIME RISK FOR DIABETES IN U.S.

- NHANES III - metabolic syndrome
  - 24% of men; 23.4% of women
  - 42% of individuals > age 60
- Lifetime risk of diabetes if born in 2000
  - 32.8% men, 38.5% women
- Underscores need to control obesity epidemic /improve physical activity

» Narayan, et al JAMA 2003;290:1884
Caloric mathematics

- 3500 calories = pound
- Caloric deficit: 500 cals/d = 1lb/wk
- 650,000 - 1,000,000 calories / year
Diet: Essential component of CV Prevention

Primordial
- Physical activity
- Healthy eating
- Ideal weight
- Psychosocial factors
- Familial predisposition

Primary
- Lipids
- Hypertension
- Smoking cessation
- Diabetes
+ Primordial

Secondary
- ASA
- ACE-I
- Rehab
- β-blockers
+ Primary

Relationship Between Diet and CV Disease

Diet → Intermediary Biological Mechanisms* → Risk of Coronary Heart Disease

*Includes lipid levels [LDL-C, HDL-C, triglycerides, Lp(a)], blood pressure, thrombotic tendency, cardiac rhythm, endothelial function, systemic inflammation, insulin sensitivity, oxidative stress, homocysteine level

Hu FB et al. JAMA. 2002;288:2569-2578
Problem with “Diets”

- Semantic confusion
  - “Diet” from Latin *diaeta*…..a way of life
- Fad Diets
  - >95% who lose wt gain it back
  - restriction/complexity predict failure

Elements of Diet

- Composition
- Quality
- Quantity
OPTIMAL DIET FOR CV HEALTH-EVIDENCE?

• Low-CHO Diets
  – Glycemic Index
• Very Low-Fat Diets
• Mediterranean Diet / DASH Diet
Low Carb Diets

I THINK IT'LL BE OK AS LONG AS WE DON'T EAT THE BUNS...

THE ATKINS DIET
Effects of Low-CHO vs. Low fat diets on Wt loss / CV Risk Factors (Meta-analysis)

- 5 trials, 447 subjects
- > wt loss at 6 mo. (mean -3.3 kg)
- No difference at 12 mo
- Attrition
  - 38% vs. 46%
- Lipids
  - TG: -22.1 mg/dL
  - HDL: 4.6 mg/dL
  - LDL: -5.4 mg/dL (low fat)

Real Reason for Weight Loss?

- **MACRONUTRIENT COMPOSITION?**
  - Low-CHO Diet

- **CALORIC DEFICIT**
  - Decreased Caloric Intake (Even When Calories Not Restricted)

- **CONFOUNDING FACTORS**
  - Initial Wt Loss Provides Motivation
  - Exercise


Low-CHO Diet / Risk of CHD in Women

- Nurses Health Study - 82K, 20 yr f/u
  - Low-CHO diet not associated with increased risk; RR 0.94 (0.76-1.18)
  - When vegetable sources fat/protein chosen: RR 0.70 (0.56-0.88)
  - Higher glycemic load: RR 1.90 (1.15-3.15)

50 g CHO
whole grain spaghetti vs. white bread

Ludwig DS. *JAMA* 2002;287:2415.
Very-low fat diets

- $\leq 15\%$ calories from fat (33 g for 2000 cal diet)
  - 15% protein
  - $\geq 70\%$ CHO
    - (complex carbs and whole foods, avoid simple sugars)

Lipid Changes
Very-Low Fat / Vegetarian Diets

- Low-fat diet (15-20%)
  - ↓ TC and LDL by 10-20%
  - ↓ HDL, ↑ TC/HDL ratio, sometimes
  ↑ TGs

Very Low-fat Angiographic Studies

- **Heidelberg Trial** (113 pts - stable angina)
  - Diet (< 20% fat, ≤ 200 mg cholesterol + exercise vs. usual care)
  - 10% reduction in coronary plaque progression by QCA
- **Lifestyle Heart Trial (Ornish)** (moderate-to-severe CAD)
  - Intensive lifestyle program: vegetarian diet (10% fat, 70% complex CHO) vs. usual care
  - 1 yr: greater ↓ TC, LDL-C, HDL-C, ↑ TG than usual care
  - At 1 and 5 yr: > ↓ stenosis (P≤0.02) / cardiac events (P<0.001) than usual care

Mediterranean Diet….Key Component?

## Protective Effects of Med Diet

<table>
<thead>
<tr>
<th>Secondary Prevention Trials</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DART (N = 2000)</strong></td>
<td>29% ↓ mortality</td>
</tr>
<tr>
<td></td>
<td>Fatal MI ↓ 11% to 8%</td>
</tr>
<tr>
<td><strong>Indo-Mediterranean Diet</strong> (N = 1000)</td>
<td>↓ cardiac deaths (3% vs 1%)</td>
</tr>
<tr>
<td></td>
<td>↓ Nonfatal MI (9% vs 4%)</td>
</tr>
<tr>
<td><strong>Lyon Heart Study (N = 605)</strong></td>
<td>Cardiac death, nonfatal MI (↓ 4% to 1.2%)</td>
</tr>
<tr>
<td><strong>GISSI-Prevenzione Trial</strong> (N = 11,324)</td>
<td>CVD deaths ↓ from 6% to 5%</td>
</tr>
<tr>
<td></td>
<td>Total mortality ↓ from 10% to 8%</td>
</tr>
<tr>
<td><strong>Indian Experiment of Infarct Survival-4 (N = 360)</strong></td>
<td>Cardiac deaths ↓ from 22% to 11%</td>
</tr>
<tr>
<td></td>
<td>Nonfatal MI ↓ from 25% to 13%</td>
</tr>
</tbody>
</table>

### Diet Evidence: Primary Prevention

22,043 adults - adherence to a Med diet (points given for high consumption of vegetables, legumes, fruits, nuts, cereal; subtracted for high consumption of meat, poultry, and dairy)

<table>
<thead>
<tr>
<th>Variable</th>
<th># of Deaths/ # of Participants</th>
<th>Fully Adjusted Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death from any cause</td>
<td>275/22,043</td>
<td>0.75 (0.64-0.87)</td>
</tr>
<tr>
<td>Death from CHD</td>
<td>54/22,043</td>
<td>0.67 (0.47-0.94)</td>
</tr>
<tr>
<td>Death from cancer</td>
<td>97/22,043</td>
<td>0.76 (0.59-0.98)</td>
</tr>
</tbody>
</table>

Trichopoulou A et al. *NEJM* 2003;348:2595-6
Mediterranean Diet (Lifestyle) and 10 yr Mortality in Elderly Europeans

- Healthful Lifestyle Factors
- Prospective study, 2300 elderly Europeans
- Adhering to Med diet, mod. Alcohol, physical activity, non-smoking associated with 60% ↓ all-cause mortality

Mediterranean Diet & Reduction in Metabolic Syndrome

- Meta-analysis of 50 studies; 535K
- Adherence associated with 31% reduction in MS
- Protective effects
  - Waist circ: -0.42 cm
  - HDL: +1.17 mg/dl
  - TG: -6.14 mg/dl
  - Syst BP: -2.35 mm Hg
  - Diast BP: -1.58 mm Hg
  - BG: -3.89 mg/dl

Kastorini CM, et al. JACC 2011;57
Primary Prevention of Cardiovascular Disease with a Mediterranean Diet

The “Modernization” of Man

(Am J Clin Nutr 1999;70:560s)
Classification of fats
Defilippis AP and Sperling LS. Am Heart J 2006;151:565
Metabolic pathway of omega-6 and omega-3 fatty acids

Defilippis AP and Sperling LS. Am Heart J 2006;151:565
Inuits- Dietary Adaptation

• Greenland Inuits
  – Ancestors lived on whales, seals, fish
  – Favorable FADS genetic variants detected
    • 95%
    • 15% Chinese
    • 2% Europeans

Trans fats

- Lipid effects
  - Increase LDL and TG’s, decrease HDL

- CV risk
  - 5 g / d associated with 25% ↑ risk
  - 47% ↑ sudden death

- Per calorie most dangerous macronutrient

- FDA-mandatory specifications (Jan. 2006)
  - <500 mg TFA can be listed as 0

DASH: Effects of Diet on Blood Pressure

- **Dietary Approaches to Stop Hypertension**
- 459 adults mild HTN (<160/80-95)
  - 8 wks
    - 1) Control diet *or*
    - 2) High fruit/vegetable diet *or*
    - 3) DASH combination diet (high fruit/vegetable, low saturated fat and cholesterol, high calcium, high potassium)
- **Sodium** intake and **body weight** remained constant

DASH Study
Effects of Diet on
Systolic and Diastolic Blood Pressure

Salt and CVD- A problem we can lick?

- 7227 participants – NHANES (What We Eat in America survey)

- > 75% sodium consumed from processed foods (65.2%) and restaurants (24.8%)

- Recommended by IOM
  - < 2300 mg for all
  - < 1500 mg for @ risk group

CDC MMWR : Vol. 61, Feb. 7, 2012
Comparison of Atkins, Ornish, Wt Watchers, and Zone (Wt Loss & Heart Disease Risk Reduction)

• 160 randomized
  – Known cardiac RFs
  – Mean BMI 35
• Main outcomes:
  – 1 yr wt change
  – Effect on cardiac risk factors
  – Dietary adherence rates

Diets: Randomized Comparison

• No difference 1 yr wt loss
  ( Atkins 2.1 kg, Zone 3.2, Wt Watchers 3.0, Ornish 3.3)
• Greater effects in study completers
  ( Atkins 53%, Zone 65%, Wt Watchers 65%, Ornish 50%)
• Each diet reduced LDL by 10%
  – No significant effect on BP or BG
• Wt loss associated with adherence; not with diet type
• For each diet decrease in TC, CRP, insulin associated with wt loss (no significant difference between diets)

“Portion Distortion”

Understanding + controlling portion, package, and tableware size – key to limiting caloric intake (22-29% reduction)

Serving size….cup pasta…baseball

Hardee's "Monster" Thickburger
2 1/3-pound slabs of Angus beef
4 strips of bacon
3 slices of cheese
Mayonnaise
Buttered sesame seed bun

1420 Calories
107 g Fat

Blackburn GL, Cleveland Clinic Journal of Medicine 2005; 72(7)
Cochrane Library Review, 9/14/15
Eat less at dinner and you will live to 90

Ancient Chinese Proverb
National Weight Control Registry: Successful Losers

• **Self-monitoring**
  - Diet: food records; limit certain foods / food quantity
  - Weight: check body weight >1x/week

• **Low-calorie diet**
  - Total energy intake: 1300–1500 kcal/day

• **Eat breakfast daily**

• **Regular physical activity**: 2500–3000 kcal/week (eg, walk 4 miles/day)

5 AHA Metrics - Ideal CV Health

• **OPTIMAL DIET**
  1. Fruits & veg > 5 servings/d
  2. Two 3.5 oz. servings fish/wk
  3. > 3 servings 1 oz. whole grains/d
  4. < 1500 mg/d sodium
  5. < 36 oz. sugar-sweetened beverages/wk

USDA Nutrition Guidelines – June 2011

• 7 Key Messages
  1. Enjoy food but eat less
  2. Avoid oversized portions
  3. half plate fruits/vegs
  4. Water over sugary drinks
  5. Fat free /low-fat milk
  6. Compare sodium in foods
  7. > half grains whole
2015 Dietary Advisory committee report

• Healthy dietary pattern
  – Higher in veg, fruit, whole grains, low fat dairy, seafood, legumes, nuts
  – Flexible to meet health needs, dietary preferences, cultural traditions

• Limit dietary sodium <2300 mg/d

• Limit saturated fat < 10% total calories

• Limit added sugars < 10% total calories
Cardiovascular Benefits of Dark Chocolate

- Cacao beans used as currency for Aztecs
- Benefits related to epicatechin (flavanol)
- NO bioavailability & mitochondrial function
- Favorable effects on BP, lipids, inflammation
- Lower risk CAD, stroke, CV mortality

Higginbotham E, Taub PR. Current Treatment Options CV Medicine, in press
40 Diets rated (available evidence)

Panel of 20 experts

7 parameters (1-5 scale)
ST wt loss
LT wt loss
Diabetes
Heart health
Ease of compliance
Nutritional completeness
Health risks
U.S. News Best Diets

• DASH  TLC  Mayo  Mediterranean  Wt  Watchers

• Volumetrics  Jenny Craig  Biggest loser  Ornish

• Vegetarian  Slim fast  Fat belly  Nutrisystem

• Abs  South beach  Vegan  eco-Atkins

• GI  Zone  macrobiotic  Medifast

• Atkins  Raw food  Dukan  Paleo
U.S. News Best Diets

• Overall Best
  – DASH
  – TLC
  – Mayo Clinic
  – Mediterranean
  – Weight watchers
U.S. News Best Diets

- Heart-Healthy
  - Ornish (?)
  - TLC
  - DASH
  - Mediterranean
  - Vegan
OPTIMAL DIET FOR CV HEALTH?
Evidence?

- **Low-CHO Diets**
  - Short-term Wt ↓; long-term effects unknown
- **Glycemic Index**
  - guide to decreased consumption of energy dense carbs
- **Very-Low Fat Diets**
  - Possible ↓ CV events; concerns about sustainability
- **Mediterranean Diet**
  - Primary and secondary prevention; ↓ metabolic syndrome; healthy; sustainable
- **DASH**
  - ↓ BP; similar to Mediterranean

Modified from Parikh P, McDaniel M, Ashen D, Miller J, Sorrentino M, Blumenthal R, Sperling LS. Diets and CV Disease: An Evidence-Based Assessment, JACC 2005;45:1385
Thanks......
Hunter-Gatherer Diet (Mismatch between modern lifestyle / Paleolithic genome)

- Whole, natural foods
- Fruits, veggies, nuts, berries
- Omega 3’s
- Avoid trans-fats; limit saturated fats
- Lean protein
- Olive oil, non-trans canola
- Water
- Daily exercise

Southern Diet Associated with Higher Stroke Risk

- REGARDS study
  - Reasons for Geographic & Racial Differences in Stroke
  - > 20K, age > 45, weekly diet habits, > 5 yr f/u
- Southern dietary pattern
  - 41% increased risk / 63% in AA
- Med type diet
  - 29% lower risk

Judd S, et al., presented 2/7/13, Am Stroke Association meeting
“speedo” sign

"APPLE SHAPE" is a common manifestation of abdominal obesity in men. In contrast, obese women typically carry their weight on their hips and thighs, leading to the "pear shape." Researchers believe that abdominal obesity is riskier than lower-body obesity.

Scientific American
2004;14(3):20
U.S. News Best Diets- (2014 Update)

- Reviewed......
  - Traditional Asian Diet
  - Anti-Inflammatory Diet (Andrew Weil)
  - Engine 2 Diet (Esselstyn)
  - Flexitarian Diet

2015

– HMR (Health Management Resources) Diet
– The Body Reset Diet
– The Supercharged Hormone Diet

2016

– MIND Diet
– Whole 30 Diet
– Fertility Diet
“SUPER SIZE ME”
Morgan Spurlock

- Documentary - eating at McDonald’s 1 month; reduced physical activity
- Up to 5000 calories/day
- BP increased from 120/80 to 150/100
- TC increased from 165 to 230
- Weight increased 24 pounds
Supersizing: Hidden Toll on Pocketbook

• Single fast food meal
  – 927 to 1324 kcal (extra $0.67)
  – 73% more calories / 17% price
  – 36 grams adipose

• Calculated costs (1 yr) > short-term value
  – Increase auto fuel, maintenance food, health care costs by $3.10-$7.72

• Close RN and Schoeller DA. Jl Am Coll Nutrition 2006;25(3):203-209
The Twinkie Diet

• Kansas St. Univ. Nutrition Prof.
• 10 weeks
• Twinkies, Nutty Bars, powdered donuts…..
• Doritos, sugar cereals, Oreos…. 
• MVI, protein shake, green beans
• < 1800 cals/d
• LOST 27 LBS
Big Apple Bans Trans Fats

- NYC Board of Health unanimously approved Dec. 5, 2006
- First city in U.S.
- Ban into effect July 2007
Dietary cholesterol controversy

- paragraph in > 500 page report
- 2015 Dietary GLs Advisory committee
- “no longer nutrient of concern for overconsumption”
- “no appreciable relationship b/w consumption of dietary chol & serum chol”