“Evaluating Popular Diets”

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Obesity: A Growing Epidemic

• Approximately 167 million adults are considered overweight in the United States
  • 60 million are obese
  • 9 million are severely obese

• In 03–04 National Health and Nutrition Examination Survey (NHANES) an estimated 66 % of U.S. adults are either overweight or obese.

www.obesity.org and www.cdc.gov
Obesity Trends* Among U.S. Adults
BRFSS, 1990, 1995, 2005
(*BMI ≥30, or about 30 lbs overweight for 5’4” person)

1990

1995

2005

No Data <10% 10%–14% 15%–19% 20%–24% 25%–29% ≥30%
Obesity Trends* Among U.S. Adults

BRFSS, 1985

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

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Obesity Trends* Among U.S. Adults

BRFSS, 2005

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)
Obesity and its Health Consequences

- Obesity is associated with many chronic diseases:
  - Coronary Heart Disease
  - Type 2 Diabetes
  - Metabolic Syndrome
  - Hypertension
  - Dyslipidemia
  - Osteoarthritis
  - Gall bladder disease

http://www.nhlbi.nih.gov/guidelines/obesity/ob_home.htm
Third National Health and Nutrition Examination Survey (NHANES III), 1988-94, was conducted on a nationwide probability sample of approximately 33,994 persons 2 months and over.
Weight Loss Industry

• Is a billion dollar industry offering numerous books, supplements, and products for weight loss.

• Limited scientific research is available to identify long-term safety and efficacy of most popular diets.
Popular Diets

• **Very Low-fat, High-carbohydrate Diets:**
  – Dean Ornish Diet, Pritikin Diet

• **High-fat, Low-carbohydrate Diets:**
  – Atkins Diet, Sugar Busters, South Beach Diet

• **High-protein Diets:**
  – The Zone Diet, Protein Power

• **Commercial Diets:**
  – Weight Watchers, Jenny Craig, LA Weight Loss

• **Low-Glycemic Index Diets:**
Very Low-fat, High-carbohydrate Diet

• Ornish Diet developed by Dean Ornish, M.D. is a low-fat, high-fiber vegetarian diet formulated to reverse heart disease and recently used as a weight-loss program.

• 10% fat, 20% protein, and 70% carbohydrates.

• No meat or fish, limited amount of non-fat dairy products, egg whites, and simple carbohydrates allowed.
In a randomized trial of 41 adults with atherosclerosis and BMI >26 kg/m², subjects (n=22) on the Ornish diet lost mean weight of 22 lbs at 1 year. The control group (n=19) where moderate lifestyle changes were implemented gained 1.8 kg at 1 year.

Ornish Diet decreased total cholesterol by 24.4% and low-density lipoprotein LDL cholesterol by 31.5%.

Limitations: small subject number

Low-fat, High-carbohydrate Diet Cont

A recent study in the American J. of Medicine reported that 64 overweight, postmenopausal women on a low-fat, vegan diet lost a significant amount of weight, 12.1 lbs compared to the control group’s 8.36 lbs (P = .012) despite the absence of prescribed limits on portion size or energy intake.

Criticisms of Low-fat Diets

- Criticism: Low-fat diets may be nutritionally inadequate.

- Very few studies have analyzed the nutritional adequacy of low-fat diets.

- In a clinical trial of low-fat diet on 64 postmenopausal women, vitamin E intake and omega 3 fatty acid intake decreased. Limitations: no control group, micronutrients analyzed based on dietary record.

- In a small study low-fat, vegan diet with comprehensive nutritional education appeared to provide adequate nutritional values, however, vitamin D intake was low. Inclusion of vitamin D and B-12 rich foods should be advised. Limitations: small group size, serum levels of vitamins were not used, possible bias of diet diary log, use of fortified soy.

Conclusions on Low-fat, High-carbohydrate Diets

- Low-fat, High-carbohydrate diets:
  - may **promote weight loss** likely due to reduced caloric intake.
  - may **improve cardiovascular risk factors** such as decreased LDL and possibly improve glycemic control.
  - may be indicated for patients with cardiovascular disease and hyperlipidemia.
  - Long-term adherence is questionable.
- Patients should be advised to increase food intake or supplement with vitamins, primarily vitamins E, D, B-12 and omega-3 fatty acids.
- Further long-term studies are needed to assess the long-term benefits of low-fat diets.
Low-carbohydrate, High-fat Diets

- Atkins Diet adopted by Robert Atkins, M.D. in the 1960s.

- Based on restriction of carbohydrates (CHO <20 g/d) in order to switch the body's metabolism from burning glucose to burning fat.

- Lipolysis begins when the body enters the state of ketosis as a consequence of running out of excess carbohydrates to burn.

- Ketones are carbon fragments created by the breakdown of fat stores.
Atkins Diet

- Begins with 2 week induction phase to initiate ketosis: liberal amounts of meat, dairy products (e.g. cream, cheese), minimal amounts of salad vegetables, and low glycemic index vegetables.

- Fruit, other vegetables, legumes, fresh dairy products, and whole grains are gradually added to the diet.

- Strict avoidance of refined grains (e.g. breads, pasta, white flour, refined sugar, milk, and white potatoes).

www.webmd.com
Weight loss was similar between groups. After 6 months, low-fat group continued to lose weight and low-CHO group maintained weight loss. Low CHO weight loss = 5.1 kg or 11.26 lbs and Low fat weight loss = 3.1 kg or 6 lbs. In the low-CHO group triglycerides (TGA) levels significantly decreased from 201 to 144 mg/dL and HDL cholesterol declined less.

Low-carbohydrate, High-fat Diets Cont

• In a one-year, multi-center, controlled trial subjects on the low-carbohydrate, high-protein, high-fat diet had lost more weight than subjects on the conventional diet (low-calorie, high-carbohydrate, low-fat diet).

  • 6 months, 7.0% vs. 3.2%
  • 12 months no significant difference, 4.4% vs. 2.5%

• Weight loss in low-CHO group likely attributed to reduced caloric intake.

• Limitations: Dietary adherence was poor and drop out rate was high.

Low-carbohydrate diet: greater increase HDL and decrease TGA. Both diets significantly decreased diastolic blood pressure and insulin response to oral glucose load.
Criticisms of Low-carbohydrate, High-fat Diet

- Criticism: Low-carbohydrate and High-fat diets are not nutritionally balanced. Low-carbohydrate diets are generally low in fruit, vegetables, and fiber and high in fat there is concern for risk of cancer.

- Long-term studies are lacking.
- Freedman et al analyzed 1 day sample menu of Atkins diet and found deficient levels of:
  - Vitamin A, E, B-6, thiamin, folate, iron, magnesium, calcium, potassium, and dietary fiber based on (RDA) Recommended Daily Allowance. Vitamin-mineral supplementation is recommended.

- In a cohort study of 146,810 adults Chao et al found that long term red meat consumption was correlated with increased colon cancer risk.

Criticisms of Low-carbohydrate, High-fat Diet

• Criticism: High amounts of saturated fats found in many low-carbohydrate and high-fat diets may increase cardiovascular risk factors.

• According to Foster et al and Stern et al low-carbohydrate diets appeared to decrease decline in HDL and did not significantly affect LDL levels. However, the inflammatory saturated fats found in high-fat diets may contribute to increased risk of CV disease.

Conclusions on Low-carbohydrate, High-fat Diets

- Low-CHO diet may:
  - **promote weight loss** likely due to caloric intake reduction.
  - **improve blood sugar control** by decreasing triglycerides and possibly decreasing insulin.

- Vitamin and mineral supplementation is advised. Caution is recommended for those at risk of cardiovascular disease and colon cancer.

- Larger and longer studies are needed to determine the effect of low-carbohydrate diet.
High-protein Diets

• Zone Diet popularized in books written by Barry Sears Ph.D.

• Claims to retool one’s metabolism with a diet that is 30% protein, 30% fat, and 40% carbohydrates.

• Claims that the Zone Diet can promote weight loss and reverse heart disease, high blood pressure, and diabetes.
The Zone Diet

- 30:40 ratio of protein to carbohydrates triggers, “The Zone”, a state of proper hormone balance between insulin and glucagon.

- Balance between insulin and glucagon releases natural, anti-inflammatory compounds called eicosanoids thought to promote cardiovascular health.
The Zone Diet

• Includes a small amount of protein at every meal and at every snack.

• "Favorable" carbohydrates twice the size of the protein portion are allowable -- these include most vegetables and lentils, beans, whole grains, and most fruits.

• High glycemic index carbohydrates are restricted: grains, breads, pasta, rice, and other similar starches.

• The diet keeps saturated fats to a minimum but includes olive, canola, macadamia nuts, and avocados.

• Overall, the diet is higher in protein and fat than traditional diets.

www.webmd.com
Body weight, waist circumference, TGA and insulin levels decreased with all three diets. The Atkins and Zone diets were shown to produce significantly ($p<0.01$) greater weight loss (A $-2.8$ kg, Z $-2.7$ kg) and reduction in waist circumference (HF $-3.5$ cm, HP $-2.7$ cm). LDL cholesterol overall decreased in individuals on the HC and Zone diets and fluctuated in the HF diet.

Comparison of Popular Diets Cont

- Atkins, Ornish, Zone, and Weight Watchers had modest weight loss effect and improvement in cardiovascular risk factors.

- Limitations:
  - high drop out rate
  - unable to determine long-term safety of diets.

### Comparison of Popular Diets Cont

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean weight loss</th>
<th>Cardiovascular risk factors</th>
<th>Glycemic Control</th>
<th>Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atkins n=40</td>
<td>2.1 kg</td>
<td>•10% decrease in LDL/HDL ratio •Increased HDL •15-20% reduction in C-reactive protein</td>
<td>Reduced TGA</td>
<td>Reduced diastolic blood pressure</td>
</tr>
<tr>
<td>Ornish n=40</td>
<td>3.3 kg</td>
<td>•Reduced LDL •10% decrease in LDL/HDL ratio •15-20% reduction in C-reactive protein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Watchers n=40</td>
<td>3.0 kg</td>
<td>•Reduced LDL •Increased HDL •10% decrease in LDL/HDL ratio •15-20% reduction in C-reactive protein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone n=40</td>
<td>3.2 kg</td>
<td>•Reduced LDL •Increased HDL •10% decrease in LDL/HDL ratio •Reduced TGA •Reduced insulin</td>
<td></td>
<td>Reduced diastolic blood pressure</td>
</tr>
</tbody>
</table>
Criticisms of High-protein Diets

• Criticism: High protein diets may have deleterious effects on renal or kidney function.

• Knight et al Studied the impact of protein intake on renal decline function in women with normal renal function or mild renal insufficiency in 1624 women over an 11-year period.

• No significant change in (GFR) Glomerular Filtration Rate (GFR was measured by serum creatinine) with high protein intake (> 75 g/day) in woman with normal renal function.

• Decline in GFR was associated with non-dairy animal protein intake in women with mild renal insufficiency (-1.21 ml/min per 1.73 m2 per 10 g of protein).

Criticisms of High-protein Diets Cont

- Criticism: High-protein diets may increase bone turnover or bone loss.

- Noakes et al showed that high protein diet for 12 weeks was not correlated with increased bone turnover or bone loss. Weight loss appears to enhance both bone breakdown and secondarily, bone formation, these variables were not significantly different between the 2 diet groups, high-protein and high-CHO.

Conclusions on High-protein Diets

• High-protein diets:
  • may help promote weight loss.
  • may improve cardiac risk factors and blood sugar control.

• Patients with impaired renal or kidney function should avoid high-protein diets.

• Further longer, larger studies are needed to assess the long-term effects and safety of high-protein diets.
Commercial Diets

• Weight Watchers
  • No foods are prohibited. Instead, each food is assigned points based on the food's calorie, total fat, and dietary fiber content.
  • Each member has a target Daily Points Range, calculated based on their body weight aimed to reach goal of 5-10% weight reduction.
  • Helps plan a more balanced, nutritious diet, control cravings and impulses, and increase activity with the aid of group support.
Weight Watchers Diet

• Of 3 randomized controlled trials on Weight Watchers, the largest reported a loss of 3.2% weight in the initial 2 years.

• According to a recent systematic review published in the Annals of Internal Medicine, the evidence to support the use of the major commercial and self-help weight loss programs is suboptimal.

Glycemic Index

• The glycemic index (GI) measures how much of a rise in circulating blood sugar a carbohydrate triggers.
• Ranks carbohydrates on a scale from 0 to 100, the higher the number, the greater the blood sugar response.
## Glycemic Index

<table>
<thead>
<tr>
<th>GI</th>
<th>GI Range</th>
<th>Blood sugar and insulin effect</th>
<th>Types of foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>55 or less</td>
<td>Slow, gradual rise</td>
<td>Most vegetables, fruit, beans, some grains – oats, barley</td>
</tr>
<tr>
<td>Medium</td>
<td>56 to 69</td>
<td>Moderate rise</td>
<td>Starchy vegetables, pastas, tropical fruits – bananas, mangos, papayas</td>
</tr>
<tr>
<td>High</td>
<td>70 or more</td>
<td>Rapid rise</td>
<td>White potato, white rice, white bread, corn flakes</td>
</tr>
</tbody>
</table>
Effects of Elevated Blood Glucose

• **Hyperglycemia:**
  – Increases inflammation.
  – Increases clotting.
  – Promotes atherosclerosis.
  – Increases damage to small vessels and nerves (retinopathy, neuropathy, kidney damage).
  – Increases carbohydrate oxidation and decreases lipid or fat oxidation.
Effects of Elevated Insulin Levels

• Hyperinsulinemia:
  – Raises your triglyceride levels.
  – Lowers your levels of high-density lipoprotein (HDL or "good cholesterol").
  – Raises your levels of low-density lipoprotein (LDL or "bad cholesterol").
  – Makes it harder for your body to clear fats from your blood after you eat.
  – Increases CHO oxidation and inhibits fatty acid oxidation.
  – Raises your blood pressure.
  – Increases your clotting.
The Relationship between Obesity, Metabolic Syndrome, Type 2 Diabetes

High GI Diet and Weight Gain

- Long-term feeding of high GI diet led to obesity in rats.
  - 16% weight gain
  - Increase in fat mass (40% more than low GI diet group)
  - 2-fold increase in abdominal fat

Low GI Diet and Weight Loss

- Higher proportion of subjects in the low GI diet group (56%) lost 5% or more of their body weight compared to those on a high GI diet (31%).

- Women on a low GI diet lost twice as much fat mass.
High GI diet (#1 and 3) produced higher levels of insulin and glucose compared to low GI diet.

Low GI Diet and Cardiovascular Risk Factors

- Insulin resistance, serum triglycerides, C-reactive protein, and blood pressure improved more with the low–glycemic load diet.

Systematic Review of Low GI Diet vs. High GI Diet - 15 Studies

- There was a small reduction in HbA1c and total cholesterol levels.

- The studies were of poor quality and had too few patients to identify clinically important effects.

Summary of Conclusions of Popular Diets

• Moderate weight loss found in short-term studies. Low-carbohydrate diets appear to promote more rapid, short-term weight loss.

• Improvement in cardiovascular risk factors:
  • Low-fat, high-protein, Weight Watchers, low GI diets:
    - Reduced LDL and total cholesterol levels.
  • Low-carbohydrate, high-protein, Weight Watchers diets:
    - Prevented HDL decline.

• Low-carbohydrate, high-protein, low GI diets appear to improve blood sugar or glucose control by decreasing triglycerides and insulin levels.

• Many studies reviewed had high drop out rate and poor dietary adherence which questions sustainability of these popular diets and their long-term efficacy.
Fed up with how her diet is going, Charlene takes a more serious aim at her target weight.
Long-term Weight Loss

- Subjects in the National Weight Loss Registry who had maintained a weight loss of at least 30 lbs for at least 1 year contribute continued consumption of a low-calorie and low-fat diet to long-term weight loss.

- Women in the registry reported eating an average of 1,306 kcal/day and men reported consuming 1,685 kcal with 23% of calories from fat.

Long-term Weight Loss

• Based on the National Weight Control Registry, successful long-term weight loss maintainers (average weight loss of 66 lbs for an average of 5.5 years) share common behavioral strategies:
  • Diet low in fat
  • Frequent self-monitoring of body weight and food intake
  • High levels of regular physical activity.

• Chances of longer-term success greatly increases with maintained weight loss for 2–5 years.

Healthy Eating, Healthy Weight

- Aim to eat a healthy, whole-foods, nutrient-dense diet balanced in:
- Abundant servings of vegetables
  Use vegetables as the main entree.
- 2-3 daily servings of fruit.
- 3-4 daily servings of whole grains.
- 3 daily servings of lean protein- beans, nuts, seeds, eggs, fish, turkey, and chicken.
- Focus on eating healthy fats from fish, avocados, olives, nuts, and seeds.
- Minimize intake of refined carbohydrates: sugar and white flour.
Regular Physical Activity

• Regular, moderate exercise:
  • Expends excess calories.
  • Boosts metabolism.
  • Improves cholesterol levels.
  • Lowers blood pressure.
  • Enhances the immune system.
  • Keeps bones strong and healthy.
• Improves mood.
Manage your Stress

• A new study published in *Nature Medicine* journal found that chronic stress stimulated a hormone, neuropeptide Y that promoted appetite especially for carbohydrate-rich foods and increased abdominal fat in mice. Chronic stress led to obesity and metabolic syndrome.

• A large, 19-year study on found that chronic work stress was directly related to general and abdominal obesity.


Thank you for your attention!

For general information and appointments:
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