Special Nutritional Needs in Diabetes

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Nutrition Treatment Goal in Diabetes

<table>
<thead>
<tr>
<th>Normal</th>
<th>IGT</th>
<th>Overt Diabetes</th>
<th>Complications</th>
<th>Disability</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifestyle &amp; other efforts in prediabetes</td>
<td>Medical Nutrition Therapy (MNT) to restore normal metabolism</td>
<td>MNT: kidney disease, etc</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Primary prevention
Secondary prevention
Tertiary prevention
American Diabetes Association (ADA) Nutrition Recommendations

Primary Prevention: 5-10% weight loss

Secondary Prevention: achieve metabolic control with ~60-70% calories from mono unsaturated fat and carbohydrate

Tertiary Prevention: Restrict sodium, potassium and other nutrient to reduce end organ damage
## World Diabetes Epidemic (millions)

<table>
<thead>
<tr>
<th>Country</th>
<th>1995</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. India</td>
<td>19.4</td>
<td>57.2</td>
</tr>
<tr>
<td>2. China</td>
<td>16.0</td>
<td>37.6</td>
</tr>
<tr>
<td>4. Russian Fed.</td>
<td>8.9</td>
<td>14.5</td>
</tr>
<tr>
<td>5. Japan</td>
<td>6.3</td>
<td>12.4</td>
</tr>
<tr>
<td>6. Brazil</td>
<td>4.9</td>
<td>12.2</td>
</tr>
<tr>
<td>7. Indonesia</td>
<td>4.5</td>
<td>11.7</td>
</tr>
<tr>
<td>8. Pakistan</td>
<td>4.3</td>
<td>11.6</td>
</tr>
<tr>
<td>9. Mexico</td>
<td>3.8</td>
<td>8.8</td>
</tr>
<tr>
<td>10. Ukraine</td>
<td>3.6</td>
<td>8.5</td>
</tr>
</tbody>
</table>

**Total** 135.3 **Total** 300.0

Overview of Past Diabetes

Nutrition Recommendations

<table>
<thead>
<tr>
<th>Year</th>
<th>Carbohydrate</th>
<th>Protein</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1921</td>
<td></td>
<td>Starvation diets</td>
<td></td>
</tr>
<tr>
<td>1921</td>
<td>20</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>1950</td>
<td>40</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>1971</td>
<td>45</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>1986</td>
<td>Up to 60</td>
<td>12–20</td>
<td>&lt;30</td>
</tr>
<tr>
<td>1994</td>
<td>*</td>
<td>10–20</td>
<td>*</td>
</tr>
</tbody>
</table>

*Based on nutritional assessment and treatment goals. †Less than 10% of calories from saturated fats.
Individualizing ADA Nutrition Macronutrient Recommendations

Carbohydrate - *Reduce adverse postprandial effects*
  - Fiber, Glycemic Index/Load & Resistant Starch
  - Sugars & Refined Carbohydrate
    (NOT Simple Versus Complex)

Fat - *Reduce insulin resistance & weight effects*
  - Fish and Omega-3 Fatty Acids
  - Mono, Poly, Sat and Trans Fatty Acids
Clinical Care: Confusion & Controversy

Should patients with diabetes:
Restrict/modify carbohydrate intake to improve post prandial glucose levels and weight??

or

Restrict/modify fat intake to control weight and lipid levels??
Structured Program (500-1000 kcal deficit and physical activity to achieve 5-7% loss)

Short-term improvement in glycemia, lipids and blood pressure (longer-term questions)

Exercise predicts long-term weight loss (strong predictor of weight-loss maintenance)
We interrupt this drive-thru order to bring you a special bulletin from your dietitian...
# American Dietetic/Diabetes Association
## Exchange System Overview

<table>
<thead>
<tr>
<th>Exchange</th>
<th>Calories</th>
<th>CHO</th>
<th>Protein</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starches (1/2 C, 1 oz)</td>
<td>80</td>
<td>15 g</td>
<td>2 g</td>
<td>trace</td>
</tr>
<tr>
<td>Fruit (1/2 C)</td>
<td>60</td>
<td>15 g</td>
<td>0 g</td>
<td>0</td>
</tr>
<tr>
<td>Milk (8 oz)</td>
<td>90-160</td>
<td>12 g</td>
<td>8 g</td>
<td>trace - 8 g</td>
</tr>
<tr>
<td>Vegetables (1/2 C)</td>
<td>25</td>
<td>5 g</td>
<td>2 g</td>
<td>0</td>
</tr>
<tr>
<td>Meat (per oz)</td>
<td>35-100</td>
<td>0 g</td>
<td>7 g</td>
<td>1-8g</td>
</tr>
<tr>
<td>Fat (tsp)</td>
<td>45</td>
<td>0 g</td>
<td>0 g</td>
<td>5g</td>
</tr>
</tbody>
</table>

**FREE FOOD** < 15 calories per serving
Quick Carbohydrate Counting

One Carbohydrate choice = 15 grams based on the ADA’s Exchange system

Exchange groups included are:
- Starch (1/2 cup, slice of bread)
- Fruit (1/2 cup)
- Milk (1 cup)
- Other Carbohydrate (varies by concentration)

Should there be modification based on the glycemic index?
Diabetes Vs. USDA Food Pyramid
Consideration of Macronutrient:
Starchy Vegetable, Legumes & Cheese
Postprandial Hyperglycemia

Acute glucose elevation after meals is associated with:

- Glucose-mediated oxidative stress
- Increase in HbA1c
- Advanced glycation end products (AGEs)

Methods to reduce postprandial glucose levels

- Alpha-glucosidase inhibitors
- Glycemic index/load potential
- Fiber(??)
- Restrict amount of carbohydrate intake
The Glucose Revolution

The authoritative guide to

The Glycemic Index

—the groundbreaking medical discovery

How controlling your blood sugar level helps you to:

Lose weight
Reduce your risk of heart disease
Improve your athletic performance
Manage diabetes
Enjoy total wellness

Jennie Brand-Miller, Ph.D. • Thomas M.S. Wolever, M.D., Ph.D.
Stephen Colagiuri, M.D. • Kaye Foster-Powell, M. Nutr. & Diet.
A High-fat, low-carbohydrate diets can impair glucose tolerance \((\text{rationale for high carbohydrate preparation diet for GTT})\).

The deterioration in glucose tolerance appears to be linked to a decrease in basal and insulin-stimulated glucose metabolism.

N-3 fatty acids and higher intake of other unsaturated fatty acids may reduce some adverse effects of a high fat diet.

Variability in clustering of obesity, sedentary lifestyle, and dietary fat intake may be related for inconsistencies.
Determients of glycemic response

Mean BMI 31.5 kg/m²; DM2 (n=9) & NGT (n = 10); 1100 kcal diet with individual variability in macronutrient distribution

Early Effects (prediet- day 4)

- Changes in fasting glucose and macronutrients: Protein (r = 0.36; ns); Fat (r = -0.54; P<0.05); CHO (r = 0.64; P<0.005)
- Increased fat oxidation and basal nonesterified fatty acids and decreased carbohydrate oxidation

Later Effects (day 4-28)

Change in abdominal fat related to fasting glucose (r = 0.51; P = 0.05) and insulin sensitivity (r = 0.48; P =0.03)
Unsaturated Fatty Acids (omega-3) may:

direct glucose toward glycogen storage
direct fatty acids toward oxidation/away from triglyceride synthesis by:

- Upregulating transcription of mitochondrial uncoupling protein-3)
- Inducing genes encoding proteins involved in fatty acid oxidation (acyl-CoA oxidase and carnitine palmitoyltransferase)
- Down regulating transcription of genes encoding protein involved lipid synthesis (fatty synthase)
Diabetes Medical Nutrition Therapy

Metabolic Intervention Goals

- **Glucose**
  - Preprandial - 90–130 mg/dl
  - Peak postprandial <180 mg/dl

- **Blood pressure**: <130/80 mmHg

- **Lipids**:
  - LDL <100 mg/dl
  - Triglycerides <150 mg/dl
  - HDL >40 mg/dl
“Control my diet, control my life style, control my carbs... What are you, some kind of control freak?”
Figure 1. Schematic illustration of the various non-pharmacological and pharmacological strategies for the management of the diabetic
Randomized Controlled Trial

Vitamin/ Mineral Supplement: Infection Rates

Relative Risk

- Diabetes
- No Diabetes
- 65 +
- < 65 y
- Overall

Ann Intern Med 2003;138:365
Review of Herbs and Dietary Supplements for Glycemic Control

108 Human Studies (N= 4,565); 58 clinical trials
- 36 Herb & 9 vitamin/mineral supplements
- 76% (44/58) suggested glycemic benefit
- Low rate of side effects
- Most promising: American ginseng & coccina indica
- Most studied: chromium
- Preliminary positive findings: Aloe vera, vanadium, nopal, Momordica chaarantia, Gymnema sylvetre
The Brief WAVE Assessment/Intervention addresses: Weight Activity Variety Excess.

The aims are to:

- Facilitate provider-patient discussion of nutrition-related health concerns.
- Use an easily remembered and quickly administered approach.
- Identify nutrition issues that need to be addressed at the office visit or by referral to a registered dietitian.
- Reinforce the important role nutrition plays in diabetes prevention and control.
**Weight Assessment**

Assess patient’s Body Mass Index.*

Patient is overweight if BMI > 25.

<table>
<thead>
<tr>
<th>Height (in)</th>
<th>Body Weight (lbs)</th>
<th>Height (in)</th>
<th>Body Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4’10”</td>
<td>&gt; 189</td>
<td>5’5”</td>
<td>&gt; 141</td>
</tr>
<tr>
<td>4’11”</td>
<td>&gt; 194</td>
<td>5’6”</td>
<td>&gt; 145</td>
</tr>
<tr>
<td>5’0”</td>
<td>&gt; 128</td>
<td>5’7”</td>
<td>&gt; 141</td>
</tr>
<tr>
<td>5’1”</td>
<td>&gt; 132</td>
<td>5’8”</td>
<td>&gt; 136</td>
</tr>
<tr>
<td>5’2”</td>
<td>&gt; 136</td>
<td>5’9”</td>
<td>&gt; 132</td>
</tr>
<tr>
<td>5’3”</td>
<td>&gt; 138</td>
<td>5’10”</td>
<td>&gt; 128</td>
</tr>
<tr>
<td>5’4”</td>
<td>&gt; 138</td>
<td>5’11”</td>
<td>&gt; 124</td>
</tr>
</tbody>
</table>

* Certain patients may require assessment for underweight and/or unintentional weight loss

**Activity**

Ask patient about any physical activity in the past week: walking briskly, jogging, gardening, swimming, biking, dancing, golf, etc.

1. Does patient do 30 min. of moderate activity on most days/wk.?  
2. Does pt do “lifestyle” activity like taking the stairs instead of elevators, etc.  
3. Does patient usually watch less than 2 hrs. TV or videos/day?

If pt answers NO to above questions, assess whether pt is willing to increase physical activity.

**Excess**

Look at one-day recall. Is patient eating too much:

- Fat? Saturated fat?  
- Calories?  
- Salt?  
- Sugar?  
- Alcohol?

- Ask about serving/portion sizes, preparation methods and added fats, like butter, mayonnaise, sour cream, salad dressing, etc.  
- Does pt. eat 4 or more meals from sit-down or take-out restaurants per week?  
- Is pt’s weekend eating much different from weekday eating?

* What does pt think are pros/cons of his/her eating pattern?  
* If pt needs to improve eating habits, assess willingness to make changes

**Variety**

Is patient eating a variety of foods from important sections of the food pyramid?  

Determine Variety and Excess using a quick one-day recall: “Briefly describe everything you ate or drank yesterday (or on a typical day) beginning with the first thing you ate after waking up.”

Grains (6-11 servings)  
Fruits (2-4 servings)  
Vegetables (3-5 servings)  
Protein (2-3 servings)  
Dairy (2 servings)

**Recommendations**

**Weight Recommendations**

If patient is overweight:

1. State concern for the patient, e.g., “I am concerned your weight is affecting your health.”  
2. Give the patient specific advice, i.e.,  
   a) Make 1 or 2 changes in eating habits to reduce calorie intake as identified by one-day recall.  
   b) Gradually increase activity/decrease inactivity.  
   c) Enroll in a weight management program or  
   d) Consult a dietitian.

3. If patient is ready to make behavior changes, jointly set goals for a plan of action and arrange for follow-up.

4. Give pt education materials/resources.

**Activity**

Examples of moderate amounts of physical activity:

- Walking 2 miles in 30 minutes  
- Stair-walking for 15 minutes  
- Washing and waxing a car for 45-60 minutes  
- Washing windows or floors for 45-60 minutes  
- Gardening for 30-45 minutes  
- Pushing a stroller 1 1/2 miles in 30 minutes  
- Raking leaves for 30 minutes  
- Shoveling snow for 15 minutes

1. If patient is ready to increase physical activity, jointly set specific activity goals and arrange for follow-up.

2. Give pt education materials/resources.

**Excess**

How much is too much?

Too much fat, saturated fat, calories

- >6 oz/day of meat  
- Ice cream, high fat dairy products  
- Fried foods  
- High fat snacks and desserts  
- Eating out > 4 meals/wk

Too much sugar, calories

- High sugar beverages  
- Sugary snacks/desserts

Too much salt

- Processed meats, canned/frozen meals, salty snacks

1. Discuss pros and cons of pt’s eating pattern keeping in mind Variety and Excess.  
2. If patient is ready, jointly set specific dietary goals and arrange for follow-up.


4. Consider referral to a dietitian for more extensive counseling and support.
Weight Activity Variety and Excess (WAVE)

Quick Assessment & Intervention

Integral Care Components

Ask

Advise

Assist

- Make referrals to address issues in-depth based on readiness to make changes
Weight

Ask about weight history, goals, and competing demands

Advise related to metabolic control and cardiovascular risk factors

Assist in setting stage appropriate goals & refer to RD or program if ready
Activity

Ask -- about activity and inactivity (TV etc)

Advise – tailor your advice to risks and discuss concept of working in activity to daily routine if exercise or working out are not realistic

Assist -- Provide information about & referral if testing is needed
Variety

**Ask** – About vegetables, sources of fiber (legumes and high fiber cereals, calcium (dairy products, calcium fortified foods or supplements)

**Advise** – Focus on personal risk, e.g., markers related to metabolic control

**Assist** – Discuss relevant options considering personal values etc, negotiate. Try to establish simple doable goals. Refer, if appropriate
Ask – Focus questions about common problem area – High sugar foods, e.g., Sweetened beverages/juices, High fat foods, e.g., fries, snack foods, and supersizing of portions

Advise – Discuss how these food may affect metabolic control

Assist – Provide information about resources and refer when ready to make changes
Diabetes Nutrition Referral Issues

- Integrate nutrition into your overall diabetes workup by briefly address: Weight, Activity, Variety and Excess.

- Refer patients with diabetes to RD for in-depth *Medical Nutrition Therapy*:
  - For identified nutrition-related issues
  - *When* patient is ready to address the identified issues.
Medicare Coverage

• Diabetes Medical Nutrition Therapy
  – 3 hours of nutritional counseling in the first year
  – 2 hours in subsequent years
  – additional hours, if ordered by physician

• Diabetes Self-Management Training
  – 10 hours in the first year
  – 2 hours in subsequent years
Special Nutritional Needs in Diabetes

Conclusions

1. Goal: Diabetes Medical Nutrition Therapy to achieve **metabolic** control
2. Weight loss goal ~ 7% based on evidence for primary prevention of diabetes
3. Dietary composition flexible (~ 70% calories from mon and carbohydrate)
   4. Carbohydrate counting & other strategies used to control postprandial glucose (15 g starch, fruit & milk)
5. Diabetes Medical Nutrition Therapy **NOT** Meds when diet fails