Nutrition therapy in diabetes

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Severance Hospital
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46 years old woman, T2D for 1y, oral anti-diabetic drugs
Ht 161 cm / Bwt 76 kg

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (FBS)</td>
<td>128 mg/dL</td>
<td>Glucose (PP2)</td>
<td>252 mg/dL↑</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>179 mg/dL</td>
<td>HDL-Cholesterol</td>
<td>52 mg/dL</td>
</tr>
<tr>
<td>Albumin</td>
<td>4.6 g/dL</td>
<td>TG</td>
<td>321 mg/dL ↑↑</td>
</tr>
<tr>
<td>HbA1c</td>
<td>7.9%</td>
<td>γ-GTP</td>
<td>42 U/L</td>
</tr>
</tbody>
</table>

Example

High PP2 glc & TG... Why?

Doctor, Because I wanted to loose my weight and my friend told me that potato is good for diabetes, I ate only two meals a day with potatoes a lot.
What is the problem?

1. Too much Carbs!
2. Low basic knowledge of nutrition/food
3. Unbalanced meal pattern

Needs Nutrition therapy!
Objective

• Understand the clinical nutrition in diabetes
• Practice individualized clinical nutrition
• Evaluation of caloric requirement
• Meal planning
  - Principles of diet therapy
  - Food exchange table
  - hand portion method
  - The plate model
Clinical nutrition

Clinical nutrition: A comprehensive service provided by clinical nutritionist to treat diseases or injuries

Flowchart of clinical nutrition therapy
• **Diabetic clinical nutrition**
  
  Assistance provided to help diabetic patient correct his/her behavior pattern and improve overall management of diabetes, including nutritional status.

• **What diabetic patients must know**
  
  Educating diabetes and diet therapy

  Individualized meal plan that best fits the lifestyle and diabetes management.
Objective of diabetic clinical nutrition

• Maintain blood glucose, serum lipid, blood pressure within normal limit

• Provide adequate calories:
  - Adult—Attain and maintain ideal body weight
  - Children/adolescent—Normal growth and development
  - Pregnancy, breastfeeding, critical care patients, etc.—provide adequate calorie and nutrition

• Preventing and treating acute/chronic complications of diabetes
• Promoting health by choosing healthy food and exercising regularly
• Fulfilling each individual’s nutritional requirement while also considering lifestyle preferences
Practicing individualized clinical nutrition
Practicing individualized clinical nutrition

- Health status (blood labs, complications, drug, etc.)
- Socio-economic status
- Body measurements (BMI, WHR)
- Diet problem (teeth)
- Diet evaluation (Habit, history)

Individualized target setting based on nutritional evaluation and therapy goal

Evaluating effects of nutritional management: modify diet plan if necessary

Using diet planner to construct and educate appropriate diet plan

Evaluation

Target setting

Follow-up

Education
Diet evaluation

**Methods**

- **Diet record**
  - Learn normal diet through interview
  - **Self-record**:
    - (2 weekdays, 1 weekend)

**Content**

- **Diet pattern everyday/special day** (regularity, binge eating, etc.)
- **Amount, frequency**
- **Diet balanced?**
- **Eating out, snack, alcohol**
- **Depending on folk medicine?**
- **Socio-economic status**
- **Problems in eating (teeth, etc.)**

Helps plan, target, and reinforce diet therapy
<table>
<thead>
<tr>
<th>Type</th>
<th>Time (place)</th>
<th>Food</th>
<th>Ingredient</th>
<th>Amount (about...)</th>
<th>Blood glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>8:00 (Home)</td>
<td>Barley rice</td>
<td>Barley</td>
<td>1/3 bowl</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Roast seaweed</td>
<td>Seaweed</td>
<td>1/2 plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sesame oil</td>
<td>1/2 teaspoon</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kimchi</td>
<td>Cabbage kimchi</td>
<td>1/2 plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coffee</td>
<td>Coffee</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sugar</td>
<td>5g</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Powder milk</td>
<td>10g (fat:2g)</td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td>10:30 (Home)</td>
<td>Milk</td>
<td>Low fat Milk</td>
<td>200mL</td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td>13:00 (Work)</td>
<td>White rice</td>
<td>White rice</td>
<td>1 bowl</td>
<td>230 (2 hours after meal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cabbage-miso soup</td>
<td>Cabbage</td>
<td>1/2 plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fried noodle</td>
<td>Noodle, Beef, Spinach</td>
<td>1/2 bowl</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sesame oil</td>
<td>1/4 plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 teaspoon</td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td>19:00 (Chinese restaurant)</td>
<td>Noodle with black sauce</td>
<td>Noodle Onion Pork Oil</td>
<td>1 portion</td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
<td>Pickle</td>
<td>Radish</td>
<td>1/2 plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kimchi</td>
<td>Cabbage kimchi</td>
<td>1/2 plate</td>
<td></td>
</tr>
<tr>
<td>Night snack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Folk medicine (Deer horn)
- Exercise
- Other
Determining caloric requirement
Calculation of caloric requirement

• Calculation based on **ideal body weight**

• Modified according to **activity level, age, weight change, etc.**

• Consider normal caloric intake

• Long-short-term target weight based on individual’s appropriate weight rather than ideal body weight.

• Consider normal growth/development for children and adolescents
Ideal body weight / Evaluating obesity

Ideal body weight

Appropriate weight to maintain health in everyday life

- Men = Height (m) × Height (m) × 22
- Women = Height (m) × Height (m) × 21

Obesity (BMI)

<table>
<thead>
<tr>
<th>BMI (kg/m²)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 18.5</td>
<td>Underweight</td>
</tr>
<tr>
<td>18.5~22.9</td>
<td>Normal</td>
</tr>
<tr>
<td>23~24.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>≥ 25</td>
<td>Obese</td>
</tr>
</tbody>
</table>
Determining caloric requirements in adult

- Daily requirement (kcal/day) = IBW (kg) × coefficient for activity level

<table>
<thead>
<tr>
<th>Obesity / Activity level</th>
<th>Caloric requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese / Low physical activity</td>
<td>IBW × 25~30 (kcal/day)</td>
</tr>
<tr>
<td>Normal / Average physical activity</td>
<td>IBW × 30~35 (kcal/day)</td>
</tr>
<tr>
<td>Low body weight / Intense physical activity</td>
<td>IBW × 35~40 (kcal/day)</td>
</tr>
</tbody>
</table>

Ex) IBW 60kg, average physical activity and exercise. Requirement?

60kg × 30 ~ 35 = 1800 ~ 2100 kcal/day
Diet planning
MAGIC FOODS for BETTER BLOOD SUGAR
3 Major Principles of diet therapy

- Regularly
- Properly
- Balanced
Good diet habit (brief)

- Regularly eat right amount of food at regular interval.
- Beware of simple sugars (sugar, honey, etc.).
- Consume enough dietary fiber.
- Consume adequate amount of fat; restrict cholesterol.
- Avoid salt intake.
- It is recommended to avoid alcohol.

Diabetic diet is healthy diet! Families participate together.
Nutrients

- Carbohydrate
- Protein
- Fat
- Vitamin
- Minerals
Nutrients to blood glucose

- Fat: Minimal conversion to blood glucose
- Protein: Minimal conversion to blood glucose
- Carbohydrate: 100% turns into blood glucose
How can we know amount of carbs?

1. Look at the label
2. Search on internets
3. Use ‘Food Exchange Table’
Diet planning using

- Local food guides
- Food exchange table
- The hand portion method
- The plate model
Simple diabetes meal planning

ADA 2018

A simple and effective approach to glycemia and weight management emphasizing portion control and healthy food choices may be considered for those with type 2 diabetes who are not taking insulin, who have limited health literacy or numeracy, or who are older and prone to hypoglycemia.

Grade. B
Local food guide

China

The Food Guide Pagoda for Chinese People

- Oils 25~30g
- Salt 6g
- Milk and milk products 300g
- Soybean and Nuts 30~50g
- Meat and Poultry 50~75g
- Fish and Shrimp 50~100g
- Eggs 25~50g
- Vegetables 300~500g
- Fruits 200~400g
- Cereals, Tubers and Other beans 250~400g
- Water 1200mL

Chinese Nutrition Society
Healthy meal plan for Type 2 DM pts.

Local food guide

Japan

Physical Activity

5-7 SV Grain dishes
(Rice, Bread, Noodles, and Pasta)

5-6 SV Vegetable dishes

3-5 SV Fish and Meat dishes
(Meat, Fish, Egg and Soy-bean dishes)

2 SV Milk
(Milk and Milk products)

2 SV Fruits

Enjoy Snacks, Confection and Beverages moderately!

water or teas

※ SV is an abbreviation of “Serving”, which is a simply countable number describing the approximated amount of each dish or food served to one person.
Local food guide

Vietnam

Healthy meal plan for Type 2 DM pts.
Local food guide

EXERCISE
PERSONAL & ENVIRONMENTAL HYGIENE

- Do regular exercise in most days of the week for at least 30 minutes.
- Practice good personal and environmental hygiene.

EATING PLAN FOR HEALTHY LIVING
Eat a variety of foods everyday to ensure that all nutrients are provided in proper amount and balance.
Use iodized salt and eat other fortified foods to increase the intake of micronutrients.

Food and Nutrition Research Institute
Department of Science and Technology
General Santos Avenue, Siquijor, Taguig City
Tel./Fax: 637-23-34, 637-31-64
http://www.fnri.dost.gov.ph

Source: Nutritional Guidelines for Filipinos (NSP) 2000
Food exchanges

• Similar food types placed in same exchange groups

• Within groups, a single food based on weight, measure, size has the same carbohydrate or kcal value as another

• Food from different groups cannot be interchanged

ex)

1 exchange unit

1/3 bowl of Rice (70g) = 1 slice of Bread (35g) ≠ 1½ tsp of Butter

International Diabetes Federation
Food exchange table

- Groups everyday food with similar nutritional components into 6 food groups
- Grains, Fish and meat, Vegetable, Fat, Milk, Fruits
- Nutritional component of each food group

<table>
<thead>
<tr>
<th></th>
<th>Calories (kcal)</th>
<th>Carbohydrate (g)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td>100</td>
<td>23</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Fish and meat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-fat</td>
<td>50</td>
<td>-</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Mid-fat</td>
<td>75</td>
<td>-</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>High-fat</td>
<td>100</td>
<td>-</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Vegetables</td>
<td>20</td>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Fats</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole</td>
<td>125</td>
<td>10</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Low-fat</td>
<td>80</td>
<td>10</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Fruits</td>
<td>50</td>
<td>12</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Korean Diabetes Association, Food exchange table guideline. 2010
Grain (Carbohydrate 23g, Protein 2g, 100kcal)

- Rice cake 50g (3 pieces)
- Sweet potato 70g (1/2 piece)
- Potato 140g (1 piece)
- Corn 70g (1/2 piece)
- Cracker 20g (5 pieces)
- Grain powder 30g (1/4 cup)

If possible, pick multigrain rice and wheat breads than white rice/bread.
### Fish and Meat (carbohydrate 8g, fat 2~8g, 50~100kcal)

<table>
<thead>
<tr>
<th>Low-fat</th>
<th>Mid-fat</th>
<th>High-fat</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Chicken meat 40g (1 piece)" /></td>
<td><img src="image" alt="Beef sirloin 40g (1 piece)" /></td>
<td><img src="image" alt="Chicken with skin 40g (1 drumstick)" /></td>
</tr>
<tr>
<td><img src="image" alt="Pork loin 40g (1 piece)" /></td>
<td><img src="image" alt="Mackeral 50g (1 small piece)" /></td>
<td><img src="image" alt="Bacon 40g" /></td>
</tr>
<tr>
<td><img src="image" alt="Stingray 50g (1 small piece)" /></td>
<td><img src="image" alt="Hairtail 50g (1 small piece)" /></td>
<td><img src="image" alt="Tuna can 50g (1/3 cup)" /></td>
</tr>
<tr>
<td><img src="image" alt="Anchovies 15g (¼ cup diced)" /></td>
<td><img src="image" alt="Black bean 20g (2 large spoon)" /></td>
<td><img src="image" alt="Fried tofu 30g (5 pieces)" /></td>
</tr>
<tr>
<td><img src="image" alt="Pollack 15g (½ piece)" /></td>
<td><img src="image" alt="Tofu 80g (1/5 block)" /></td>
<td><img src="image" alt="Cheese 30g (1.5 piece)" /></td>
</tr>
</tbody>
</table>

- Foods in high-fat group also contain large amount of fat and cholesterol. Beware when planning diet.
Vegetables (Carbohydrate 3g, Protein 2g, 20kcal)

- Spinach 70g (1/3 cup boiled)
- Carrot 70g (1/3 large piece)

Eat raw or marinated instead of juicing to increase dietary fiber.
Fat (fat 5g, 45kcal)

- Soybean oil 5g (1 teaspoon) = Pine nut (1 tablespoon)

- Sesame oil 5g (1 teaspoon)
- Walnut 8g (1.5 piece)
- Peanuts 8g (8 pieces)
- Italian dressing 10g (2 teaspoon)
- Mayonasi 5g (1 teaspoon)

- Avoid deep-fries: use in stir-fry or vegetable marination
- Nuts should be limited to 1-2 units/day for calorie control
• Low-fat milk contains less saturated fat and cholesterol compared to normal milk.
Fruits (Carbohydrate 12g, 50kcal)

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Quantity</th>
<th>Weight (g)</th>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>80g</td>
<td>1/3 piece</td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>350g</td>
<td>2 pieces</td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td>50g</td>
<td>1/2 piece</td>
<td></td>
</tr>
<tr>
<td>Strawberry</td>
<td>150g</td>
<td>7 pieces</td>
<td></td>
</tr>
<tr>
<td>Watermelon</td>
<td>150g</td>
<td>1 slice</td>
<td></td>
</tr>
<tr>
<td>Tangerine</td>
<td>120g</td>
<td>2 pieces</td>
<td></td>
</tr>
<tr>
<td>Persimmon</td>
<td>50g</td>
<td>1/3 pieces</td>
<td></td>
</tr>
</tbody>
</table>

1 Unit 2 Units/day

- Fruit juices have low dietary fiber. Eat fresh fruits.
Food distribution per meal

- Keeping meal time and amount in regular interval crucial for maintaining steady blood glucose
- Meal frequency and snacks based on everyday lifestyle
- Example of distributing exchange units in 1800kcal meals

<table>
<thead>
<tr>
<th>Food group</th>
<th>Units</th>
<th>Morning</th>
<th>Snack</th>
<th>Lunch</th>
<th>Snack</th>
<th>Dinner</th>
<th>Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat and fish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-fat</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-fat</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>4</td>
<td>1</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Adjust according to drugs, hypoglycemic time, gestational diabetes, and blood glucose level
Meal planning using ‘**Carbohydrate counting**’

- Focus on consumed carbohydrates that determined blood glucose, rather than total calories.
- Emphasis on **total amount** of carb, not the type.

<table>
<thead>
<tr>
<th>Basic carb. counting</th>
<th>Distribute regular amount of carbohydrate into meals and snacks at same time very day to maintain steady carbohydrate intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced carb. counting</td>
<td><strong>Multiple insulin</strong> injection or using insulin pump</td>
</tr>
</tbody>
</table>

- Not easy to apply to other culture...
  → need to develop own ‘**Food Exchange Table**’
Healthy meal plan for Type 2 DM pts.

Handy portion method

**Carbohydrates (starch and fruit)**
- choose an amount equivalent to the size of two fists.
- For fruit use one fist

**Protein**
- choose an amount equivalent to the size of the palm of your hand and the thickness of your little finger

(Reprinted with permission from CDA, 2003)
Handy portion method

Vegetables
:choose as much as you can hold in both hands.
These should be low CHO vegetables – green or yellow beans, cabbage or lettuce.

Fat
:limit fat to an amount the size of the tip of your thumb.

Drink no more than 250 ml of low-fat milk with a meal

(Reprinted with permission from CDA, 2003)
Healthy meal plan for Type 2 DM pts.

Plate model

- Fruit
- Milk/yogurt
- Vegetable
- Vegetable
- Protein
- Starch/cereal
Plate model

Useful as a basic teaching tool for people who

• Have recently been diagnosed

• Want a **simple** plan or find it difficult to implement other advanced plans

• Have difficulty reading or dealing with numbers

• Learn better by visualising

• **Eat out frequently**

• Want to reduce the amount of proteins or carbohydrates they ingest
**Macronutrients Composition**

**ADA 2018**

There is no single ideal dietary distribution of calories among carbohydrates, fats, and proteins for people with diabetes; therefore, macronutrient distribution should be individualized while keeping total calorie and metabolic goals in mind. *[Grade E]*

A *variety* of eating patterns are acceptable for the management of type 2 diabetes and prediabetes. *[Grade B]*

<table>
<thead>
<tr>
<th></th>
<th>ADA</th>
<th>CDA</th>
<th>KDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td>Based on Individualized assessment of current eating patterns, preferences, and metabolic goals.</td>
<td>45-60%</td>
<td>50-60%</td>
</tr>
<tr>
<td>Protein</td>
<td>15-20% <em>(or 1-1.5g / kg BW)</em></td>
<td>15-20%</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>20-35%</td>
<td>&lt;25%</td>
<td></td>
</tr>
</tbody>
</table>