Clinical Practice Guidelines: Management of Type 2 Diabetes Mellitus (5th Edition) 2015

Topic Four: Medical Nutrition Therapy & Low Glycaemic Index Diet
Medical Nutrition Therapy

- MNT is important in preventing and managing diabetes as well as delaying complications of DM.

- Proper diet is crucial at any stage of management of DM including those on medications.

- The goals of MNT together with medications are:
  - to attain, maintain blood glucose
  - blood pressure and
  - lipid profile as close to normal as safely as possible.

- These goals can be achieved through healthy food choices
General recommendations

Nutrition care by a dietitian should be provided under the following conditions:

– at diagnosis
– sub-optimal metabolic and/or weight control
– at initiation of insulin therapy
– development of other co-morbidities such as hyperlipidaemia, hypertension and chronic kidney disease.
General recommendations

Diet counseling is effective to help lower A1c by an average of 1–2%.

Evidence on Effectiveness of MNT

- Newly diagnosed type 2 diabetes: 2%
- Type 2 diabetes with an average duration of 4 years: 1%

Diabetes MNT has the greatest impact at initial diagnosis, and it continues to be effective at any time during the disease process (Grade A)

Pastors et al, Diabetes Care 2002; 25:608-613;
Specific recommendations: Prevention of Diabetes

Weight loss of 5-10% of initial body weight over a 6-month period is recommended for all overweight or obese patients who have or at risk for diabetes.

A reduced calorie diet. Standard weight-loss diets reduce daily energy by 500–1,000 kcal to achieve an initial weight loss of ½-1 kg per week. 50 (Level I)

Physical activity of 150 minutes per week i.e. 30 minutes five days or more per week. 51 (Level I)

Meal replacements (MRPs) can be used as part of a comprehensive meal plan for weight loss and weight maintenance. 52 (Level I)

A combination of reduced calorie diet, physical activity and behaviour modification can provide greater initial weight loss. 51 (Level I)
**Quick Guide of Selecting The Right MRP**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Calories</strong></td>
<td>190 to 250</td>
<td>For MRPs fewer than 200 calories, add an extra 15 to 20 grams of carbohydrates (about 100 calories) by including fat-free light yogurt, low-fat whole-grain crackers, fresh fruit or fat-free milk. Raw or cooked non-starchy vegetables (which are low in calories but contribute extra fiber, vitamins and minerals) may be eaten with any of the MRPs.</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>10 to 15 grams</td>
<td>Adequate protein promotes health and mealtime fullness.</td>
</tr>
<tr>
<td><strong>Carbohydrate</strong></td>
<td>14 to 34 grams</td>
<td>To slow the rate blood glucose (sugar) rises after a meal, look for the first carbohydrate listed in the ingredients to be maltodextrin or tapioca dextrin rather than refined sugars, such as sucrose, corn syrup, high-fructose corn syrup or brown rice syrup.</td>
</tr>
<tr>
<td><strong>Dietary Fiber</strong></td>
<td>3 to 6 grams</td>
<td></td>
</tr>
<tr>
<td><strong>Total Fat</strong></td>
<td>5 to 8 grams</td>
<td>The primary fat source should be unsaturated fat from vegetable oils rather than saturated fat, such as partially hydrogenated oil, palm oil or coconut oil. All MRPs should be trans-fat free.</td>
</tr>
<tr>
<td><strong>Cholesterol</strong></td>
<td>0 to 20 milligrams</td>
<td></td>
</tr>
<tr>
<td><strong>Sodium</strong></td>
<td>100 to 300 milligrams</td>
<td></td>
</tr>
<tr>
<td><strong>Vitamins and Minerals</strong></td>
<td>Look for 50 to 100 percent of the Dietary Reference Intake.</td>
<td></td>
</tr>
<tr>
<td><strong>Avoid products containing stimulants</strong>, such as caffeine, ginseng, guarana and ephedra.</td>
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</tbody>
</table>
Specific recommendations: Prevention of Diabetes

A high dietary fiber diet is encouraged for the prevention of diabetes. A high fibre diet (20–30 g fibre/day) consisting of vegetables, fruits, legumes and whole grain cereals is encouraged. 54 (Level II-2) Higher consumption of whole grains can contribute to the prevention of T2DM. 54 (Level II-2)

Whole grains should form 50% of the total grains intake as recommended by the Malaysian Dietary Guidelines, 2010.
Figure 2. Forest Plot Showing the Multivariate-Adjusted RR of Type 2 Diabetes for a **Two-Servings-per-Day Increment in Whole Grain Intake** for Individual Cohort Studies and All Studies Combined

Meyer 0.85 (0.75-0.96)
Fung 0.80 (0.71-0.90)
Montonen 0.90 (0.81-1.01)
van Dam 0.65 (0.55-0.78)
NHSI 0.70 (0.62-0.79)
NHSII 0.83 (0.69-0.98)
Combined 0.79 (0.72-0.87)

http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.0040261
Limit consumption of sugar-sweetened beverages (SSB) to less than 2 servings a day or about 10% of total daily caloric intake for prevention of diabetes and weight gain 55,56 (Level II-2).
Specific recommendations: Dietary management

Total carbohydrate (CHO) intake should be monitored in patients with T2DM. 57 (Level I)

There is no ideal percentage of energy for carbohydrate, protein and fat for diabetes.

A minimum of 130 g/day CHO should be provided to ensure adequate intake of fiber, vitamins, and minerals, as well as to prevent ketosis and to provide dietary palatability. 58 (Level I)
The Best DIET?

CHO – 45-60% energy (min 130g)
Protein – 15-20% energy
FAT – 25-35% energy
Carbohydrate Intake – Malaysia

MNT recommend (45%en)

Figure 8: Changes in composition of calories from protein, fat and carbohydrates in Malaysia between 1961-2000

Whole grains should form 50% of the total grains intake as recommended by the Malaysian Dietary Guidelines 2010.

**TYPE**

- Rice, bread, cereals, flour
- Fruits
- Legumes & pulses
- Starchy vegetables
- Milk & milk products
- Sugars, sweets, cakes, kuihs

**ENCOURAGE WHOLEGRAINS, FRUITS, VEGETABLES, LEGUMES**

**MINIMISE INTAKE OF SUGARY FOODS AND BEVERAGES**

Foods with fewer than 20 calories and 5 grams of carbohydrate are considered “free.”
Total CHO percentage of 45 to 60% of total energy is recommended. The percent depends on weight, glycemic & other metabolic goals, cultural preferences and individual lifestyle.

<table>
<thead>
<tr>
<th>Population</th>
<th>Carb choices (meal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inactive women</td>
<td>2-4</td>
</tr>
<tr>
<td>Active women or inactive men</td>
<td>3-5</td>
</tr>
<tr>
<td>Active men</td>
<td>4-6</td>
</tr>
<tr>
<td>Carb choices (snack)</td>
<td></td>
</tr>
<tr>
<td>Between meal or HS Snacks</td>
<td>1-2</td>
</tr>
</tbody>
</table>

1 cup noodles/Rice/Starchy vegetable ~ one cupped hand (2 exchanges)

½ cup rice/noodles 1 serve of fruit (1 exchange)
70 - 90g of CHO per meal (5 - 6 exchanges)
How much cereals per meal?

Breakfast / Lunch / Dinner

<table>
<thead>
<tr>
<th>Noodle 1-1½ cup</th>
<th>Whole meal bread 2-3 slices</th>
<th>Rice 1-1½ cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oat 6 tbsp</td>
<td>Biscuits 6 pcs</td>
<td>Capati 1 pc</td>
</tr>
</tbody>
</table>

* Suitable for sedentary women & inactive men
**What about snacks?**

<table>
<thead>
<tr>
<th>Bread</th>
<th>Biscuits</th>
<th>Corn (6 inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popiah</td>
<td>Apam</td>
<td>Fruit</td>
</tr>
</tbody>
</table>

Snacks can be eaten in 1-2 servings as shown. Suitable for sedentary women & inactive men.
What about Fruits?

<p>| | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>Kiwi</td>
</tr>
<tr>
<td>Papaya</td>
<td>Orange</td>
</tr>
</tbody>
</table>

1 serving of fruit is as shown above. Fruits can be eaten 2 – 3 servings a day.
CHO intake must be kept consistent on a day-to-day basis if patient is on diet therapy alone, oral anti-diabetic agents (OADs) or fixed insulin regime.

It is prudent to individualise the distribution of the total CHO exchanges allowed in a day into meals according to the patient’s lifestyle.

If patient is adjusting their meal-time insulin doses or on insulin pump (i.e. flexible insulin) consistency is not required.

Insulin doses should be adjusted to match CHO intake. Self-monitoring of blood glucose is essential to adjust CHO intake and insulin dose.
Sucrose (e.g. table sugar) intake must be counted as part of the total carbohydrate intake.\(^{59}\) (Level III)

Excess sucrose intake contributes to calories and may cause weight gain.\(^{60}\) (Level I)

### Table: CHO Exchanges

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Exchange Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honey</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Jam</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Kaya</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Syrup</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Cocoa/ Malt-based Powder</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Condensed Milk</td>
<td>1 tablespoon = 10 g</td>
</tr>
<tr>
<td>Candy</td>
<td>1 tablespoon = 10 g</td>
</tr>
</tbody>
</table>

1 CHO exchange = 15g CHO, 65kcal

= 1 teaspoon = 5g  = 1 tablespoon = 10g
The European Food Safety Authority (EFSA) conducted a comprehensive review of the evidence in 2013 and concluded that aspartame was safe for human consumption, including pregnant women and children.

Acceptable Daily Intake: 40-50mg per kg of body weight. (set at 100X safety factor based on animal toxicology studies)

Non-nutritive sweeteners do not impact glycaemic level.  
Intake should not exceed Acceptable Daily Intake (ADI) levels.
Patients with diabetes have the same vitamin & mineral requirements as the general population. There is no clear evidence of benefit from the use of antioxidant vitamins A, C, E, selenium and herbs and omega-3 fatty acids in diabetes management. 65 (Level I)

Patients with diabetes do not require special oral nutritional supplement beverages unless malnourished, have not been eating well for prolonged periods of time or used as meal replacements for weight loss. 49 (Level III)
Controlling blood cholesterol

- Weight reduction
- Saturated fat and cholesterol
- Reduce trans fatty acids intake
- Physical activity
- Increase fiber intake
Controlling blood pressure

- Weight reduction
- Dietary sodium reduction
- Limit alcohol use
- Physical activity
- Fruits and vegetables
Cardiovascular Health Diet

A healthy diet incorporating oats, nuts and legumes, green leafy vegetables and soy protein may be beneficial for cardiovascular health.

In normotensive and hypertensive patients, a reduced sodium intake (<2,000 mg sodium/day or 5g of salt a day or 1 teaspoon) with a diet high in fruits, vegetables, and low-fat dairy products
Post-prandial hyperglycemia

Effects of Reducing PPHG

- Risk of progression to diabetes: -36
- Risk of cardiovascular events: -34
- Risk of development of new cases of hypertension: -49
Patients With Type 2 Diabetes May Spend More Than 12 Hours per Day in the Postprandial State

Duration of postprandial state

- Postprandial
- Postabsorptive
- Fasting

- Breakfast
- Lunch
- Dinner
- Midnight
- 4 AM
- Breakfast

8 AM 11 AM 2 PM 5 PM

Non-pharmacological treatment for PPG

• Weight Loss
• Exercise
• Glycemic effect of meals
  – Portion Size – esp CARBOHYDRATES
  – Glycemic Index (GI) & Glycemic Load (GL)
As defined, the GI takes into account only the **type of carbohydrate** in food and ignores the **total amount of carbohydrate** in a typical food serving,

both the **type and amount of carbohydrate** influence the postprandial and insulin responses of a given ingested food.

Ref: *F Xavier Pi-Sunyer*, AJCN 2002
Benefits of Low GI Diet

Low GI diet helps lower blood glucose levels.
Meta-analysis of 14 studies, 356 subjects (types 1 & 2 DM), 2-52 weeks duration

Mean difference
- **0.43% points in HbA1c over & above** reduction from high GI diet

Low GI foods..
1. Reduces postprandial blood glucose
2. Reduce CRP-Protein
3. Lowers HBA1c: by 0.14% to 0.5%
Factors Influencing GI Ranking

- Type of starch
- Physical entrapment
- Viscosity of fiber
- Sugar content
- Fat content
- Protein content
- Acid content
- Cooking
- Food processing

Diagram showing factors influencing GI ranking.
When substituting high GI foods with low GI choices, the principles of healthful diet must still be adhered.

### APPENDIX 3 Glycaemic Index of Foods

<table>
<thead>
<tr>
<th>Food Category</th>
<th>Low GI (&lt;55)</th>
<th>Intermediate GI (56-70)</th>
<th>High GI (&gt; 70)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread and cereals products</td>
<td>All bran breakfast cereals, Muesli, Wholegrain bread varieties</td>
<td>Capati, Idli, Oatmeal, Pita bread, wholemeal, Wholemeal barley flour bread</td>
<td>Cornflakes, Rice crackers, Roti Canai, White flour bread, Wholemeal (whole wheat) wheat flour bread</td>
</tr>
<tr>
<td>Noodle and Pasta</td>
<td>Lasagne pasta sheets, Spaghetti, white, boiled, Spaghetti, wholemeal, boiled</td>
<td>Spaghetti, white, durum wheat semolina, Udon noodles, plain, Wheat noodles</td>
<td>Fried macaroni, Fried meeohoon, Fried rice noodles, Rice noodle (kuih teow)</td>
</tr>
</tbody>
</table>
Tips to incorporate GI into meals

- Choose less refined and unprocessed foods
- Consume at least 1 low GI food at each meal
- Add high fiber and soluble fiber foods e.g. legumes
- Add lean proteins & healthy oils in meals: can help lower GI of meals
- Do not overcook starches and grains
- Monitor portion size
- Eat less ripe fruits e.g. less ripe bananas
- Food combination: mix high GI with low GI foods in meals
Summary

• Medical nutritional therapy is the mainstay of prevention and treatment of T2DM. [Grade A]

• For obese and overweight patients, weight loss of 5-10% of initial body weight over a 6-month period is recommended to prevent T2DM. [Grade A]

• A balanced diet consisting of 45–60% energy from carbohydrate, 15–20% energy from protein and 25–35% energy from fats are encouraged. [Grade C]

• Monitoring carbohydrate intake is important in management of T2DM [Grade A].

• Substituting low GI foods for higher GI foods at mealtime reduces postprandial blood glucose.[Grade A]