National Diabetes Reference Materials for Pre-diabetes and Type 2 Diabetes

Introductory Materials
Disclaimer
This publication is part of an initiative under the War on Diabetes. The diagrams are illustrative and used to demonstrate concepts.

This publication is not an exhaustive presentation on the subject matter. When using this publication, the responsibility for making decisions appropriate to the circumstances of the individual patient remains with the care team member. The publication will be reviewed if new evidence emerges that requires substantive changes to its content.
You Can **Lead a Fulfilling Life**
Even with Diabetes!
You Can **Lead a Fulfilling Life** Even with Diabetes!

- Eat sensibly
- Get active
- Take your medication / insulin (if applicable)

**Types of Activities**
- Walking in the park
- Badminton
- Gardening
- Caring for grandchildren
- Engaging in hobbies requiring good vision and fine motor skills
- Engaging in fun physical activities with friends
What is Diabetes

Diabetes is a condition where your body cannot manage sugar properly resulting in too much sugar in your blood.
What is Diabetes

Diabetes is a condition where your body cannot manage sugar (glucose) properly resulting in too much sugar in your blood.
Diabetes is a Serious yet Common Condition in Singapore!

1 in 3 Singaporeans are at risk of developing diabetes

1 in 9 Singaporeans have diabetes

1 in 3 individuals with diabetes do not know they have diabetes

Why have we gone to “War on Diabetes” in 2016?

1 in 3 individuals diagnosed with diabetes continue to have high blood sugar levels

2 in 3 individuals with newly diagnosed kidney failure have diabetes

1 in 3 individuals with diabetes have eye disease

About 4 amputations occur daily in individuals with diabetes
Diabetes is a **Serious** yet **Common Condition** in Singapore!

- **1 in 3** Singaporeans are at risk of developing diabetes
- **1 in 9** Singaporeans have diabetes
- **1 in 3** individuals with diabetes do not know they have diabetes

**Why Have We Gone to “War on Diabetes” in 2016?**

- **1 in 3** individuals with diabetes continue to have high blood sugar levels
- **2 in 3** individuals with newly diagnosed kidney failure have diabetes
- **1 in 3** individuals with diabetes have eye disease
- **About 4 amputations** occur daily in individuals with diabetes
Diabetes can Cause Complications to the Body

High Blood Sugar → Blood Vessel Damage → Eye (Blindness)

High Blood Pressure → Blood Vessel Damage → Kidney (Kidney failure)

High Blood Cholesterol → Blood Vessel Damage → Foot (Amputation)

Blood Vessel Damage → Heart (Heart attack)

Blood Vessel Damage → Brain (Stroke)

Blood Vessel Damage → Teeth (Tooth decay, gum disease)
Diabetes can Cause Complications to the Body

- High blood sugar, high blood pressure and high blood cholesterol will damage blood vessels
- You may not know of the damage until you develop complications or when you screen for complications

Small Blood Vessel (Microvascular) Damage
- Nerve damage (neuropathy)
  - Loss of feeling in the feet
  - Increased risk of foot ulcers and infections
- Eye disease (retinopathy)
- Reduced kidney function (nephropathy)

Large Blood Vessel (Macrovascular) Damage
- Stroke (cerebrovascular disease)
- Heart disease (cardiovascular disease)
- Circulatory problems (peripheral vascular disease)
What Increases Your Risk of Developing Pre-diabetes and Diabetes?

- **Family Member(s) Known to Have Diabetes**
- **History of Diabetes During Pregnancy**
- **40 Years of Age and Above**
- **Body Mass Index (BMI) of 23.0 kg/m² or Higher**
- **Inactive (Sedentary) Lifestyle**
- **Unhealthy Eating Habits**
What Increases Your Risk of Developing Pre-diabetes and Diabetes?

**Non-modifiable Factors**
- Family member(s) known to have diabetes
- History of diabetes during pregnancy (gestational diabetes)
- 40 years old and above

**Modifiable Factors**
- Body Mass Index (BMI) of 23.0 kg/m² or higher
- Inactive (sedentary) lifestyle
- Unhealthy eating habits
Blood Sugar Levels Increase When You Consume Foods Rich in Carbohydrates

Sugar and refined carbohydrates are digested and enter the bloodstream quickly.
Blood Sugar Levels Increase When You Consume Foods Rich in Carbohydrates

Sugar and refined carbohydrates are digested and enter the bloodstream quickly.

White Rice
White Bread
Noodles
Kueh
When Possible, Consider Choosing Low GI Food Types

* Glycaemic index (GI)

**High GI**
- White rice, white bread, yellow noodle

**Medium GI**
- Chapati, white rice vermicelli, instant oats

**Low GI**
- Tang hoon, barley, brown rice vermicelli

Diagram compares one serving of each category

Blood Glucose Level vs. Time (Mins)
When Possible, Consider Choosing **Low GI Food Types**

- **Different foods have varied effects** on how the blood sugar is released

- **The Glycaemic index (GI)** ranks the carbohydrate in foods according to how they affect blood glucose levels

- **Carbohydrates with a low GI value** are digested slowly and cause a lower and slower rise in blood sugar level

- **Carbohydrates with a high GI value** are digested at a faster rate and cause a very fast increase in blood sugar level

<table>
<thead>
<tr>
<th>High GI</th>
<th>Medium GI</th>
<th>Low GI</th>
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<tbody>
<tr>
<td>White rice, white bread, instant rice, yellow noodles, ketupat, putu mayam, sugar sweetened breakfast cereals, mashed potato, glutinous rice, popcorn</td>
<td>Instant oats, quick cooking oats, pizza, chapati</td>
<td>Unflavoured milk, unsweetened soy milk, barley, quinoa, brown basmati rice, rolled oats, multigrain bread, pasta (al dente), brown rice (long grain), tang hoon, boiled corn</td>
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</table>

**Did You Know?**
Excess sugar in your body is converted to fat and stored in your body
High Blood Sugar Levels Cause the Pancreas (Insulin Factory) to Work Harder

Sugar and refined carbohydrates cause stress, fatigue and eventual damage to the pancreas.

Graph showing glucose and insulin levels throughout breakfast, lunch, and dinner.
Insulin is a hormone that helps to control the blood sugar level in the body.

Sugar and refined carbohydrates cause stress, fatigue, and eventual damage to the pancreas.

High Blood Sugar Levels Cause the Pancreas (Insulin Factory) to Work Harder

- Glucose
- Insulin

Breakfast Lunch Dinner
Excess Sugar and Carbohydrates are Turned into Fat

Where is the fat located?

- Fat surrounding the organs and muscles
- Fat under the skin

Consequences of Excess Fat in the Body
- High blood sugar
- High blood pressure
- High blood cholesterol

Apple-shaped body
Excess Sugar and Carbohydrates are Turned into Fat

Visceral Fat
- Fat that surrounds the internal organs produces factors that cause inflammation
- Fat also enters the organs and muscles and causes inflammation and cell damage

Consequences of Excess Fat in the Body
- Insulin resistance, high blood pressure, high LDL-cholesterol, low HDL-cholesterol and high triglyceride
There May Be Excess Fat in the Body **Even When an Individual Appears Thin**

**Healthy**

**Fat Surrounding Organs**

**Thin Outside, Fat Inside (TOFI)**
There May Be Excess Fat in the Body **Even When an Individual Appears Thin**

- Excess visceral fat (fat in or around internal organs) causes inflammation and damage to the pancreas
- You are likely to have excess visceral fat if you have an apple-shaped body
- However, if you are **TOFI (thin outside, fat inside)**, you are also at risk of diabetes

**Healthy**
- Less visceral fat

**TOFI**
- More visceral fat even though the person appears to have less fat under skin
- Higher risk of pancreatic inflammation and diabetes
Excess Internal Fat can Cause Damage

- Healthy Organs
- Healthy Insulin Level
- Pancreas Produces Less Insulin
- Converting Sugar to Energy Efficiently
- Healthy Blood Sugar Level
- Fatty Organs
- Pancreas Produces Less Insulin
- Converts Less Sugar to Energy
- Higher Blood Sugar Level
Implications of a Fatty Pancreas

- Lipotoxicity
- Beta cell death
- Less insulin production
- Sporadic high blood sugar levels (*pre-diabetes*)
- More frequent high blood sugar levels (*diabetes - 80% beta cells destroyed*)
How Insulin Works in a Normal Person

1. Insulin allows sugar into the body cell
2. Sugar is then used to **generate energy** and to maintain normal body functions
How Insulin Works in a Normal Person

1. **Insulin** allows sugar into the body cell

2. **Sugar** is then used to generate energy and to maintain normal body functions.
Excess internal fat makes body cells **less sensitive to insulin**.

1. Body cells **cannot sense insulin** properly.
2. Pancreas has to **produce more insulin** to do the same work.
Excess Internal Fat Makes Body Cells **Less Sensitive** to Insulin

1. Fat storage in organs and muscles reduces their sensitivity to insulin (insulin resistance)
2. Body cells cannot sense insulin properly
3. Pancreas has to produce more insulin to do the same work
You Can **Lead a Fulfilling Life!**

What’s **Important to You?**
You Can **Lead a Fulfilling Life!**

What’s **Important to You?**

- Walking in the Park
- Dancing
- Travelling
- Caring for Grandchildren
- Engaging in Hobbies Requiring Good Vision and Fine Motor Skills
- Engaging in Fun Physical Activities with Friends
Manage Pre-diabetes and Diabetes Well

**Blood Sugar (HbA1c)**
- 8 - Healthy Eating Habits

**Blood Pressure**
- 160/100 - Physical Activity

**Blood Cholesterol (LDL-chol)**
- 3.4

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<th>Blood Pressure</th>
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<td>8</td>
<td>160/100</td>
<td>3.4</td>
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<tr>
<td>7</td>
<td>140/80</td>
<td>2.6</td>
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Manage Pre-diabetes and Diabetes Well

- If you manage your diabetes well, you can live a normal life and prevent complications.
- Healthy eating habits and physical activity/exercise can help achieve target levels of HbA1c, blood pressure and cholesterol.

**HbA1c Targets**

1. Young/ healthy 6.0 - 6.5%
2. Elderly
3. With co-morbidities 7.0 - 8.5%
4. Prone to hypoglycaemia

Individualisation is key!
Eat Foods that Fill You Up and Turn to Sugar Slowly

- Fibre Rich Foods
- Wholegrain Starchy Food
- Whole Fruit
- Fruit Juice
- Dried Fruit
Eat Foods that Fill You Up and **Turn to Sugar Slowly**

- **Eat foods that make you feel full to prevent over-eating**
- **Fibre slows carbohydrate digestion and sugar absorption**, leading to better blood glucose control
  E.g. brown rice, chapati, whole grains, beans, seeds, fruits, vegetables
- **Eat whole fruit** instead of fruit juice (sugary drinks with minimal fibre) and dried fruit (concentrated source of sugar)

**Changes in Meals to Consider**
- Reduce sugar sweetened drinks
- Reduce snacks with sugar and refined carbohydrates
- Reduce portion sizes of carbohydrates
- Reduce fat intake
My Healthy Plate

- Eat 1 serving of fruit between your meals
My Healthy Plate

¼ plate  |  Rice and Alternatives
E.g. Brown rice, multigrain bread, lentils, beans

¼ plate  |  Meat and Alternatives
E.g. Chicken breast, fish, tofu, legumes, lean meat

½ plate  |  Vegetables
E.g. Chap chye, mushrooms, eggplant

1 serving | Fruit
E.g. Apple, blueberries, guava, pear

*Supplement your meal with 1 serving of fruit
Other Food Choices

Meat and Alternatives
- Skinless Chicken
- Beans
- Lentils
- Egg
- Prawn, White fish, Salmon
- Tofu

Fruits
- Blueberries
- Guava
- Papaya
- Pear
- Grapes
- Apple
- Guava
- Pear
Other Food Choices

Vegetables
- Broccoli
- Eggplant
- Capsicum
- Cabbage
- Kailan
- Mushrooms

Starchy Vegetables*
- Potato
- Sweet Potato
- Corn
- Pumpkin
- Peas
- Radish

*Starchy vegetables should be counted as carbohydrates
Other Food Choices

- Starchy vegetables should be counted as carbohydrates
My First Small Step (Food)

1. Bak Chor Mee
   - Add Vegetables

2. Mee Rebus
   - Leave Half the Gravy Behind

3. Nasi Briyani
   - Order Half the Rice
**My First Small Step**

| Specific | • What is your goal?  
|          | • How often or how much?  
|          | • Where will it take place? |
| Measurable | • How will you measure your goal? |
| Achievable | • Is your goal action-oriented and achievable? |
| Realistic and Relevant | • Is your goal and time frame realistic and important to you? |
| Timing | • When will you start this plan?  
|          | • For how long will you keep it up? |

**Possible Goal**

“I would like to cut down my fried and oily food intake to twice a week, preferably on a Wednesday and Saturday to reward myself for getting through the week. I will also increase my intake of vegetables in two of my three meals.”
My First Small Step (Drinks)

Kopi
- Condensed Milk
- Water
- Coffee

Kopi C Siew Dai
- Evaporated Milk
- Water
- Coffee

Kopi O Kosong
- Water
- Coffee

Sugary Drinks

One Can, One Water

Water
### My First Small Step

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Physical Activity
**Benefits** of Regular Physical Activity

- **Improves Productivity**
  Improves attention, memory and creativity

- **Improves Overall Mood**
  Reduces stress and improve mental health

- **Increases Health Benefits**
  Reduces risk of colon cancer, heart diseases, diabetes and high blood pressure

- **Increases Fitness Levels**
  Improves strength and stamina
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- **Improves Productivity**
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- **Increases Fitness Level**
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Daily Habits for Physical Activity

Accumulate a few bouts of these activities throughout a day

Take the Stairs Instead of the Lift

Brisk Walk for 10 Minutes

Walk Around Every Hour

Take 10,000 Steps Daily

Get Off One Bus Stop Earlier and Walk

Exercise with Family and Friends
Daily Habits for Physical Activity

| Specific          | What is your goal?  
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An initiative under the War on Diabetes

**LET'S BEAT DIABETES**

**Partners**

- Active Health
- Association of Diabetes Educators Singapore
- SINGAPORE NUTRITION AND DIETETICS ASSOCIATION
- SINGAPORE PHYSIOTHERAPY association
- TOUCH Diabetes Support

**Cluster Partners**

- National Healthcare Group
- NUHS National University Health System
- SingHealth

**Brought to you by:**

- MINISTRY OF HEALTH SINGAPORE
- Health Promotion Board
- aic agency for integrated care