Chronic Disease I

S3470C Nutrition Care Process

Lesson 2

Content

1. **Introduction to Metabolic Syndrome**
   - Type 2 Diabetes Mellitus
   - Cardiovascular disease
   - Hypertension
   - Hyperlipidaemia
2. **Disease Introduction & Prevalence**
3. **Aetiology of Disease**
4. **Signs & Symptoms**
   - What signs & symptoms to look out for
   - Complications
5. **Diagnostic Criteria**
6. **Clinical and Nutritional Management**

Diabetes Mellitus

Diabetes

- Group of diseases characterized by high glucose concentrations results from defect in insulin secretion, insulin action or both\
- Insulin is a hormone produced by beta cells of the pancreas that is necessary for use of storage of body fuel (carbohydrates and protein)
- Individual with diabetes do not produce enough insulin, insulin deficiency, hyperglycemia (high blood glucose) occurs

Pre-diabetes

- Individuals with a stage of impaired glucose tolerance (IGT) and impaired fasting glucose
- Indicates a high risk for diabetes and cardiovascular diseases
- Individual with fasting blood glucose higher than 7.0mmol/L or 2-hour plasma glucose test reading higher than 11.0mmol/L
- IGT can be easily reversed with dietary and lifestyle modifications to prevent or prolong progression to full blown diabetes
- Individual with IGT usually have complicated assortment of underlying condition such as hypertension, chronic inflammation

Type 1 Diabetes

- Caused by a primary defect in pancreatic beta cells
- When body's immune system destroys the pancreatic beta cells.
- The only cells in the body that produces the hormone insulin that regulates blood glucose level.
- Usually diagnosed in children and young adults.
- Risk factors can include genetics, autoimmune status and environmental factors.
- People with Type 1 Diabetes will rely on external sources of insulin to prevent ketoacidosis or death

Type 2 Diabetes

- Type 2 Diabetes accounts for 90-95% of all diagnosed cases of diabetes globally
- Characterized by a combination of insulin resistance and beta-cell failure.
- Unable to overcome related insulin resistance, i.e. decreased tissue sensitivity or responsiveness to insulin.
- It is a progressive diseases, and is usually present long before it is diagnosed.
- Hyperglycemia develop gradually, hence often asymptomatic at early stages
- Body becomes resistant to insulin or doesn't make enough
- More common in adults but rising in teens
- Risk factors: Overweight, family history, inactivity

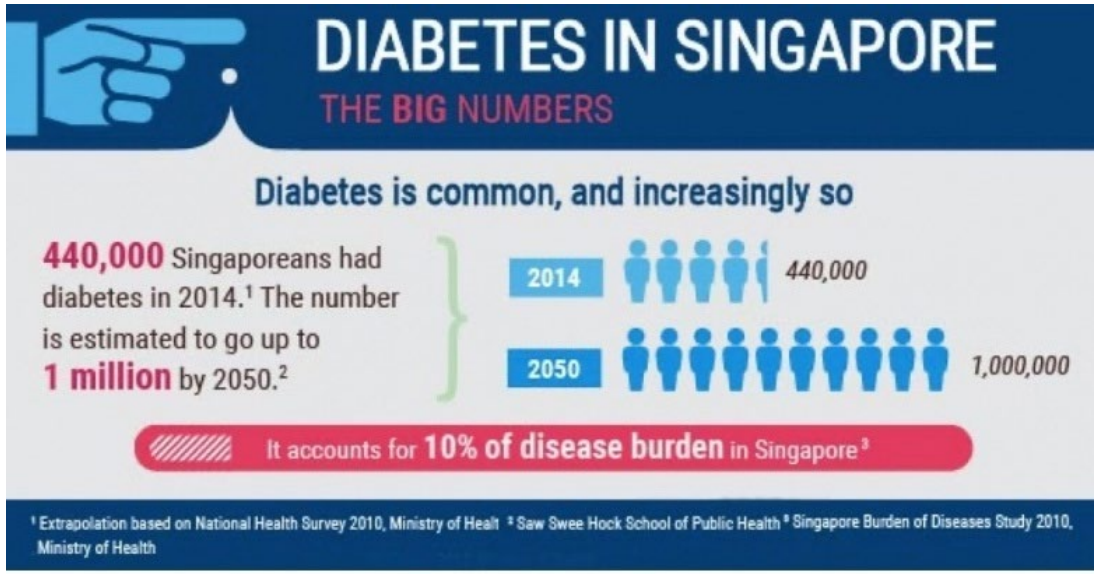
Gestational Diabetes

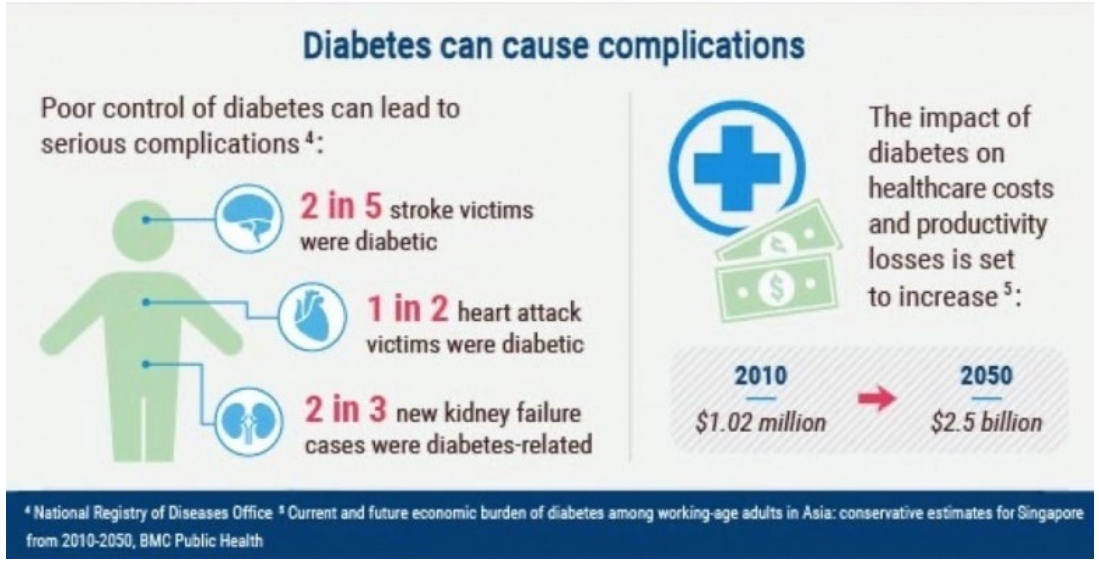
- Diabetes that occurs or detected during pregnancy
- Often resolves after birth, but increases risk of type 2 later
- Managed with diet, physical activity, and sometimes insulin
- Women who had GDM has a 35%-60% to develop diabetes later in life
- Higher pre-pregnancy weight → ∴ insulin resistant prior to pregnancy
- Late pregnancy stage significantly decreases insulin sensitivity
- Recommended to be screened for GDM at 24 – 28 weeks of gestation.

Diabetes Globally

- 589 million adults (20-79 years) are living with diabetes worldwide – 1 in 9.
- The total number of adults with diabetes is predicted to rise to 853 million by 2050 – 1 in 8.
- 4 in 5 adults with diabetes (81%) live in low and middle-income countries.
- Diabetes caused 3.4 million deaths in 2024 – 1 every 9 seconds.
- An estimated 43% of adults living with diabetes (252 million people) are undiagnosed. Almost 90% live in low and middle-income countries.
- Diabetes was responsible for an estimated USD 1.015 trillion in global health expenditure in 2024. This represents a 338% increase over the past 17 years.
- 635 million adults worldwide (1 in 8) have impaired glucose tolerance and 488 million have impaired fasting glucose (1 in 11) placing them at high risk of type 2 diabetes.

Diabetes in Singapore





Signs and Symptoms of Diabetes

- **Polyuria** (Frequent urination)
- **Polydipsia** (Excessive thirst)
- **Polyphagia** (Increased hunger)
- **Unexplained weight loss** (especially in Type 1)
- **Fatigue** or feeling very tired
- **Blurred vision**
- **Slow healing of cuts or wounds**
- **Frequent infections** (e.g., skin, gums, bladder)
- **Tingling or numbness** in hands or feet (more common in long-term or Type 2)

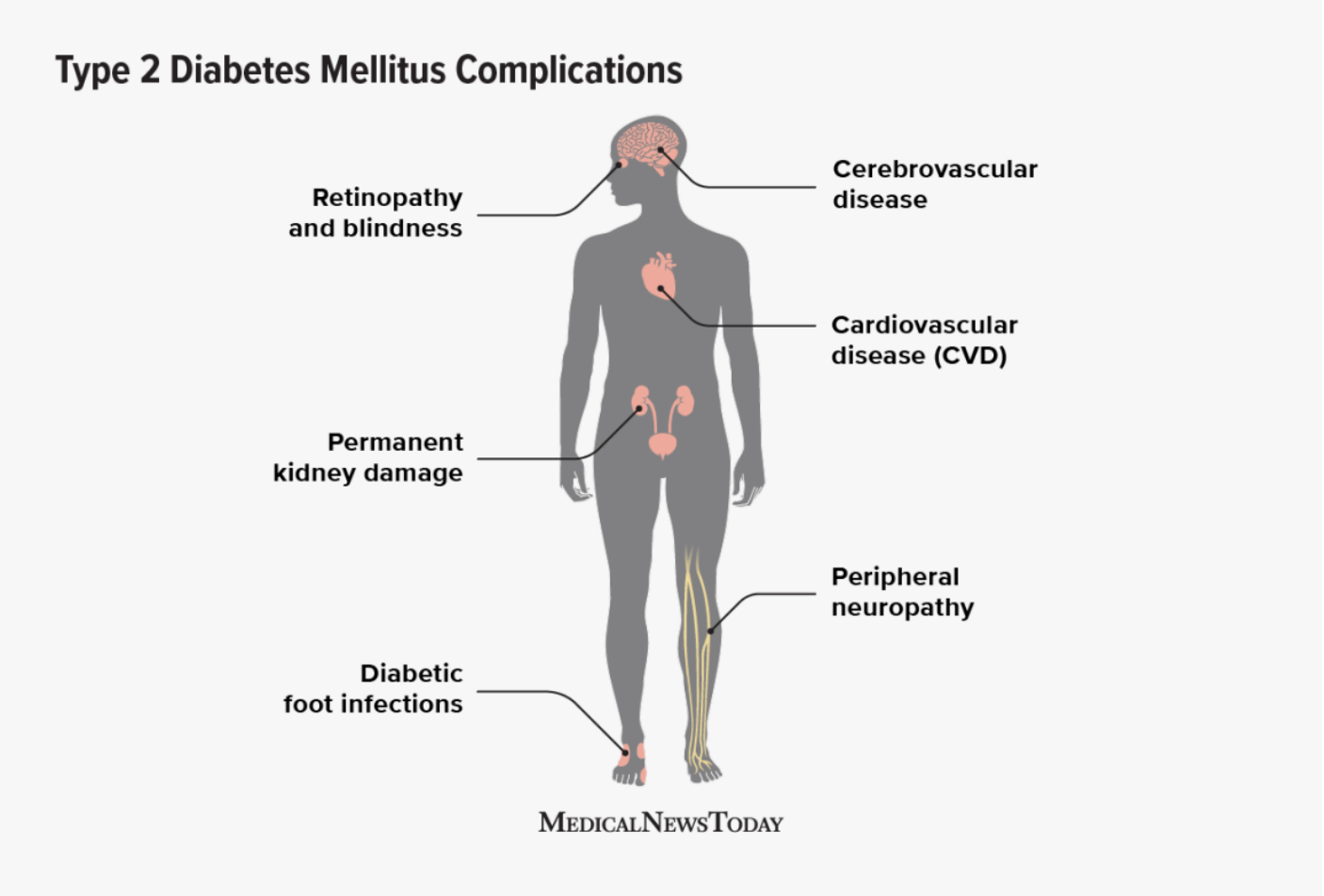
Diagnostic Criteria of Diabetes Mellitus

- In patients with typical symptoms, diabetes mellitus can be diagnosed if any of the following is present.

Type of Test	Diagnostic Range
Casual plasma glucose	>11.1mmol/l
Fasting plasma glucose	>7.0 mmol/l
2 hours post challenge plasma glucose or glucose tolerance test (OGTT)	>11.1mmol/l

- Diagnosis of diabetes is confirmed when results of two test is above the diagnostic threshold

Complications of Diabetes



Clinical Management of Diabetes

- Physical activity – can help to improve insulin resistance, manage weight and related risk factors for cardiovascular disease
- Medications – May be prescribed with insulin injections or glucose lowering drugs
- Dietary modifications

Nutritional Management of Diabetes

- Emphasize on the role of lifestyle in improving glucose control, lipid profile and blood pressure
- Improve health through food choices and physical activity
- To manage the nutrition of an induvial, we should be knowledgeable in assessing, implementing and aware of expected outcome of nutrition therapy.
- Proper data collection, assessment, intervention goals and evaluation of interventions.

GOALS OF DM NUTRITION THERAPY

1. **Attain and maintain optimal metabolic outcomes including**
   - Blood glucose levels in the normal range or as close to normal as is safely possible to prevent or reduce the risk for complications of diabetes.
   - A lipid and lipoprotein profile that reduces the risk for macrovascular disease.
   - Blood pressure levels that reduce the risk for vascular disease.

2. **Prevent & treat complications**
   - Modify nutrient intake and lifestyle as appropriate for the prevention and treatment of obesity, dyslipidaemia, cardiovascular disease, hypertension and nephropathy.

3. **Food Choices & Physical Activity**
   - Aim to improve health with the advocating of healthy food choices along with increasing physical activity

4. **Address Individuals Needs**
   - Taking into consideration personal and cultural preferences and lifestyle while respecting the individual's wishes and willingness to change.

GOALS OF DM NUTRITION THERAPY

REPUBLIC POLYTECHNIC

Type 1 DM

- To provide adequate nutrition to ensure normal growth and development, integrate insulin regimes into usual eating and physical activity habits, preserve social and psychological well-being

Type 2 DM (Children and Adolescents)

- To facilitate changes in dietary habits and physical activity level for weight management that reduces insulin resistance and improves metabolic status

Pregnant and lactating women

- Provide adequate energy and nutrients needed for optimal outcomes

Older Adults

- Provide for the nutritional and psychosocial needs of an aging individual.

Insulin Users

- Provide self-management education for treatment (and prevention) of hypoglycemia, acute illness, and exercise-related blood glucose problems

Individuals at risk for diabetes

- Decrease risk by encouraging physical activity and promoting food choices that facilitate moderate weight loss or at least prevent weight gain

Diabetes & Diet

Carbohydrate

→ Carbo-counting not proven to improve DM

→ Modest portion of complex carbohydrates incorporated into diet

→ Carbohydrate to provide ~45% - 55% of total energy requirement

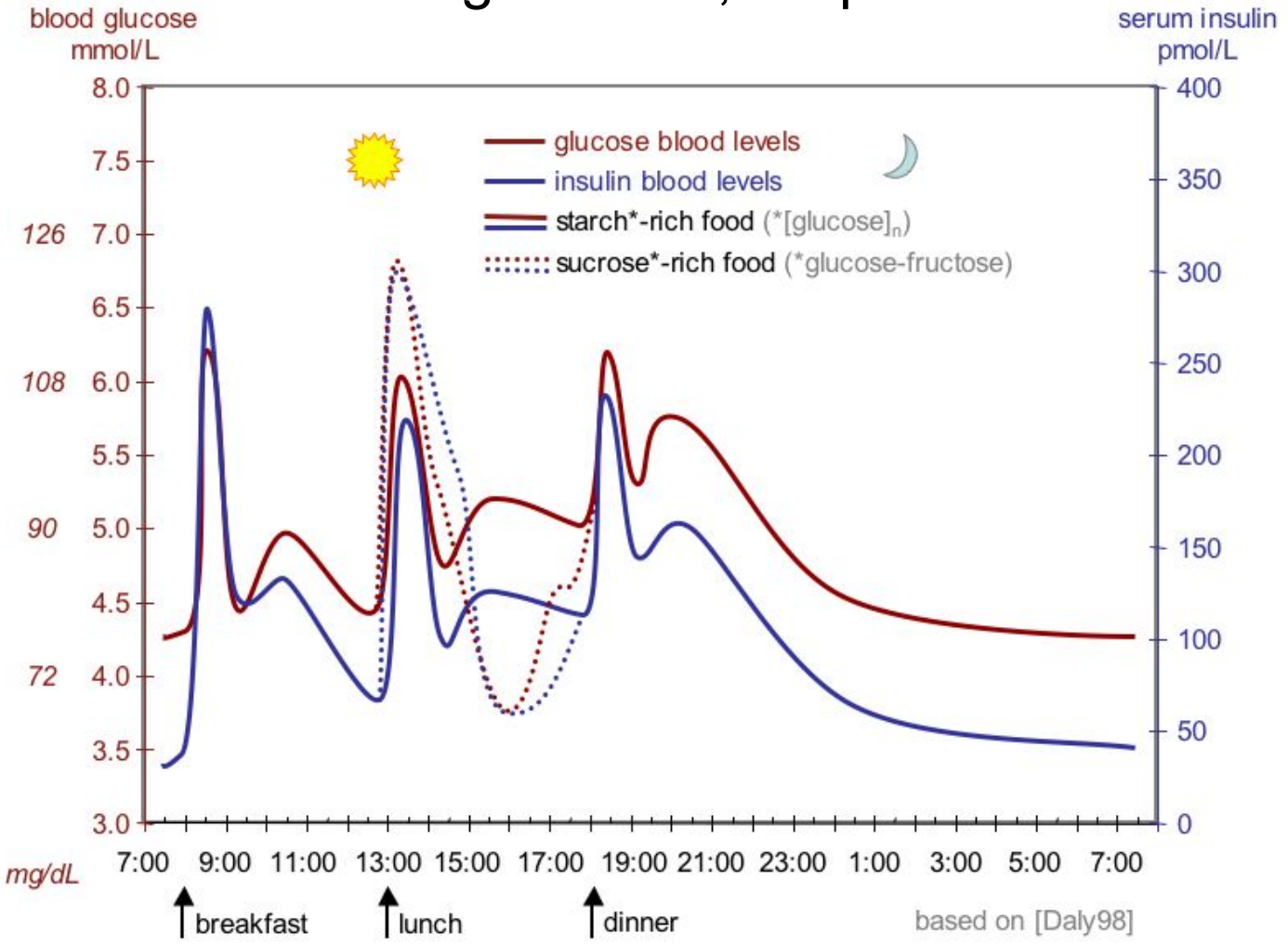
→ Aim for low to moderate glycemic index (GI) carbo-containing food + low fat

→ Spread carbo-containing food throughout the day

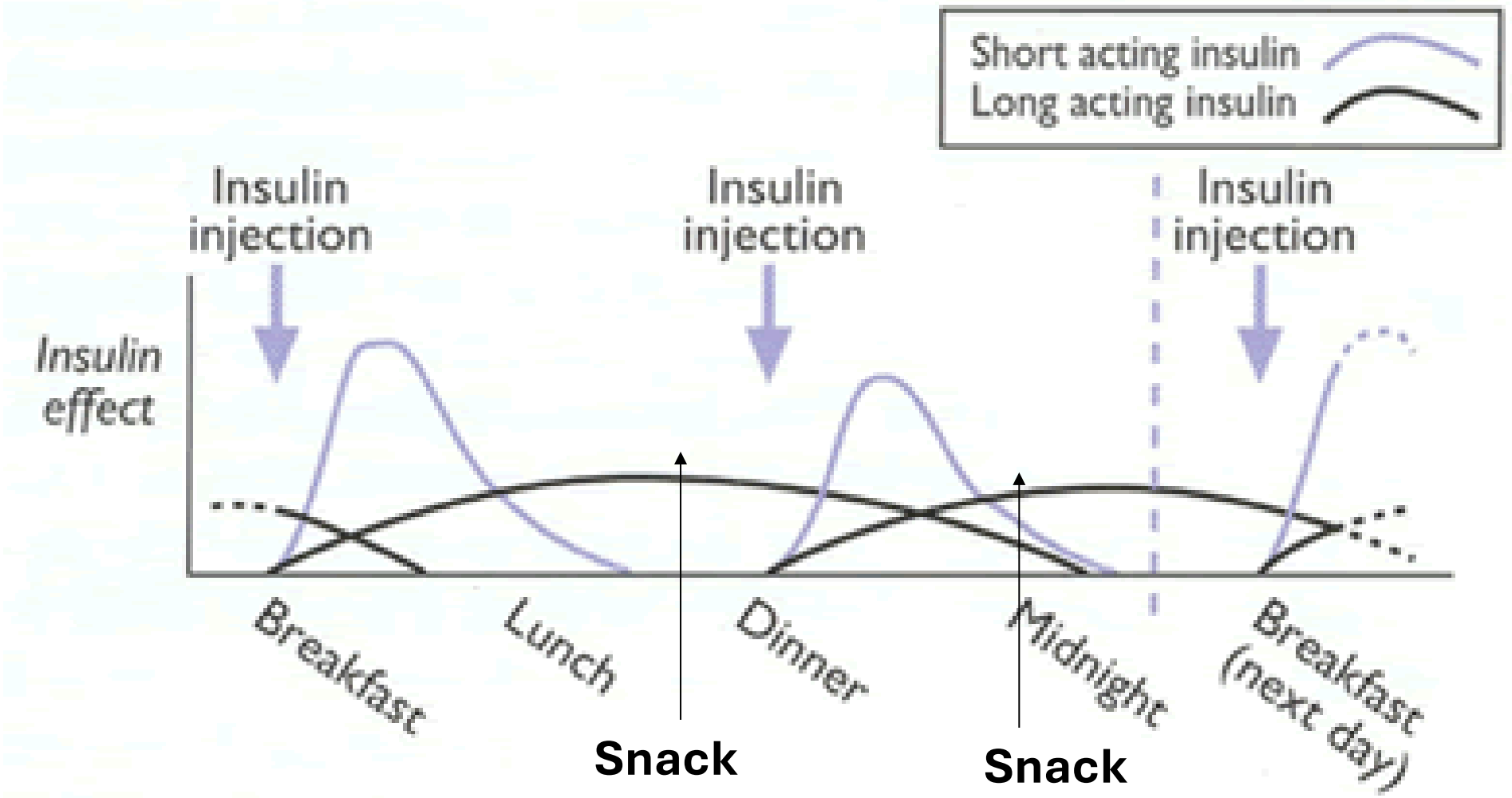
→ Shown to improve HbA1c in diabetic individual

Timing of meals

Encouraged small, frequent meals



Timing of Meals - Insulin



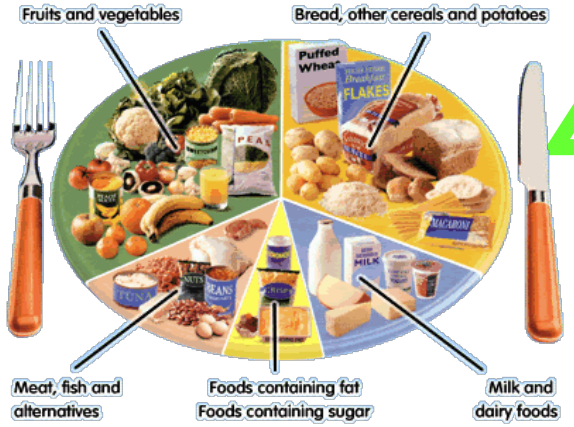
Importance of snacks in between meals

Education For DM

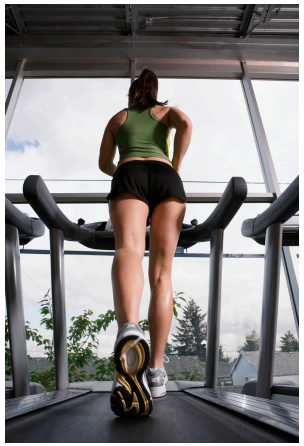
Medication/
Insulin injection

Diabetes Management

Diet



Exercise



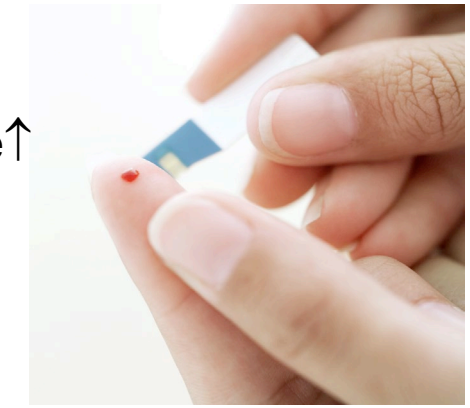
Why Maintain A Healthy Weight?

Energy Output < Energy Intake

Weight Gain

Insulin Resistance↑

↑ Blood Sugar Levels



↑ risk for Type 2 DM or poor blood sugar control

Healthy Weight Loss for DM

- Losing weight the healthy way includes
  - Limiting fat intake; especially saturated and trans fat
  - Taking lesser but sufficient amounts of carbohydrates
- To discuss with the doctor regarding the adjustment of oral glucose lowering meds or insulin before limiting carbohydrates drastically
- To refer to dietitian for counselling and meal planning

Cardiovascular Diseases

Cardiovascular Disease

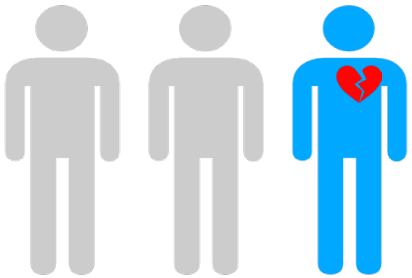
- Cardiovascular disease, also known as heart disease, is a range of conditions that affects the heart.

- It is the leading cause of death globally, with 17.9 million deaths each year.

- Type of cardiovascular diseases: Atherosclerosis, heart attack, stroke, heart failure, arrhythmia, heart valve problems

How Is Singapore Doing?

- Daily, 17 people die from cardiovascular disease (heart diseases and stroke) in Singapore.
- Cardiovascular disease accounted for 29.2% of all deaths in 2018.
- ➔ Almost 1 out of 3 deaths in Singapore, is due to heart diseases or stroke!



	2016	2017	2018
Total No. of Deaths	20,017	20,905	21,282
Ischaemic Heart Diseases	17.0%	18.5%	18.1%
Cerebrovascular Diseases (including stroke)	6.6%	6.3%	6.0%
Hypertensive Diseases (including hypertensive heart disease)	4.0%	3.4%	3.0%
Other Heart Diseases	1.9%	1.9%	2.1%
Total % of Deaths from Cardiovascular Disease	29.5%	30.1%	29.2%
Total No. of Deaths from Cardiovascular Disease	5,905	6,292	6,214

Data adopted from – Singapore Heart Foundation, 2020. https://www.myheart.org.sg/my-heart/heart-statistics/singapore-statistics/

Aetiology Of Cardiovascular Diseases (Modifiable)

- 1. Hypertension

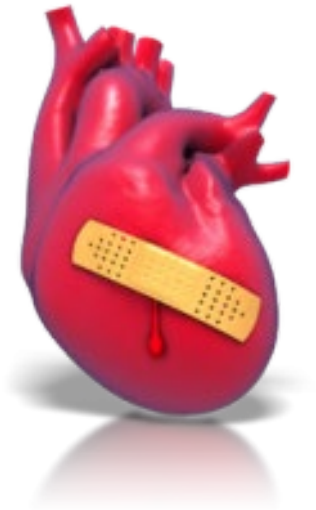
- High blood pressure (hypertension) is one of the most important risk factors for CVD.

- 2. Hyperlipidaemia

- Cholesterol is a fatty substance found in the blood that can cause blood vessels to narrow & increase risk of developing a blood clot.

- 5. Diet & Physical Inactivity

- Increases risk of hypertension, hyperlipidemia, and overweight/obesity.



- 2. Smoking

- Smoking and tobacco use is also a significant risk factor for CVD. The harmful substances in tobacco can damage & narrow blood vessels.

- 4. Type 2 Diabetes Mellitus

- High blood sugar levels can damage the blood vessels, hence more likely to be narrowed. Most T2DM are overweight or obese, which is also a risk factor for CVD.

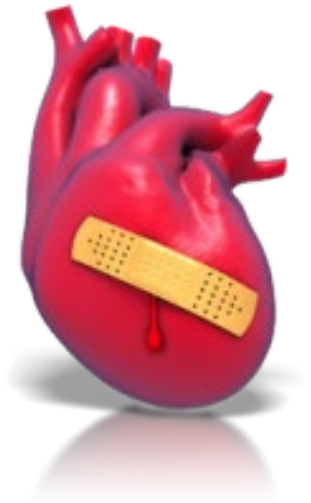
- 6. Being overweight or obese

- Being overweight or obese increases your risk of developing diabetes and high blood pressure, both of which are risk factors for CVD.

Aetiology Of Cardiovascular Diseases (Non-modifiable)

- 1. Genetics

- Family history of CVD, increases the risk of developing CVD → Father or brother diagnosed with CVD < 55y.o OR Mother or sister before 65y.o.



- 2. Ethnic background

- South Asians, African-Caribbeans/African-Americans and Mexican Americans. South Asians are found to have increased risk of CVD..

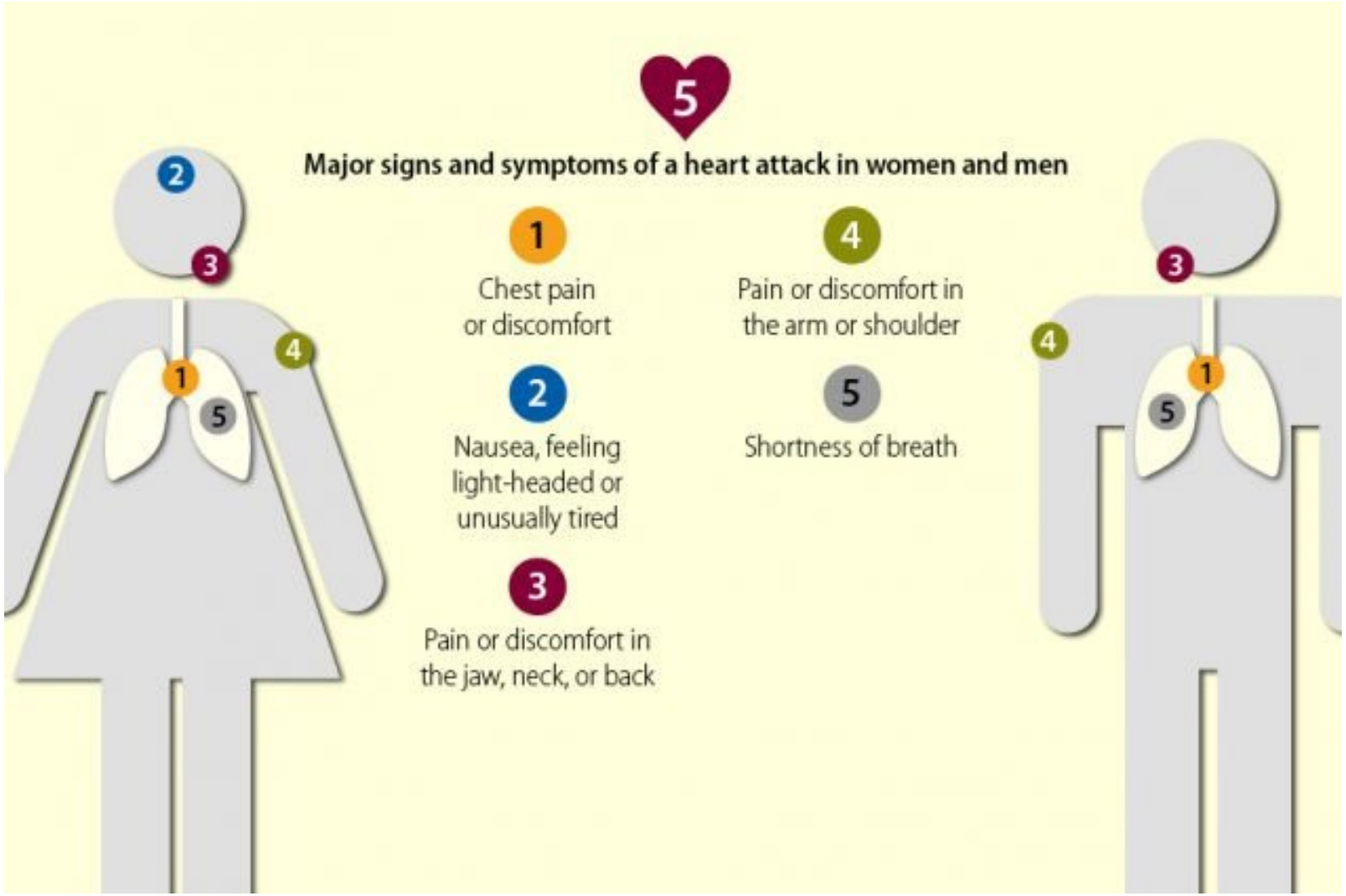
- 3. Age

- CVD risk are higher in people > 50y.o. and risk of developing it increases as you get older.

- 4. Gender

- Men are more likely to develop CVD at an earlier age than women

Signs & Symptoms of CVD



Diagnostic Criteria of CVD

- In clients present with risk factors of CVD, it is crucial to carry out laboratory test to determine the risk of atherosclerosis and cardiovascular diseases.
- ➢ Serum Total Cholesterol (TC) and HDL-C levels can be measured at any time of the day in the non-fasting state.
- ➢ Clinically relevant risk of cardiovascular disease begins with TC level of around 3.9 mmol/L (150 mg/dl) and escalates sharply when the TC exceeds 5.2 mmol/L
- ➢ 10-12 hours of fasting is necessary for the estimation of Triglycerides (TG).

Total Cholesterol in mmol/L (mg/dl)	
< 5.2 (200)	Desirable
5.2-6.1 (200-239)	Borderline high
≥ 6.2 (240)	High
LDL Cholesterol in mmol/L (mg/dl)	
< 2.6 (100)	Optimal
2.6-3.3 (100-129)	Desirable
3.4-4.0 (130-159)	Borderline high
4.1-4.8 (160-189)	High
≥ 4.9 (190)	Very high
HDL Cholesterol in mmol/L (mg/dl)	
< 1.0 (40)	Low
1.0-1.5 (40-59)	Desirable
≥ 1.6 (60)	High
Triglyceride in mmol/L (mg/dl)	
< 1.7 (150)	Optimal
1.7-2.2 (150-199)	Desirable
2.3-4.4 (200-399)	High
≥ 4.5 (400)	Very high

Diagnosis of Hypertension

- Blood pressure reading of more than 120/80mmHg will be considered abnormal.

→ Diet modifications should be the first line of treatment.

- Readings above 140/90mmHg, doctor may start pharmacological treatment.

Categories for Blood Pressure Levels in Adults (Aged 18 Years and Older)			
	Blood Pressure Level (mmHg)		
Category	Systolic		Diastolic
Normal BP	< 120	and	< 80
High-Normal BP	130	or	80 - 89
High Blood Pressure			
Stage 1 Hypertension	140 - 159	or	90 - 99
Stage 2 Hypertension	160	or	100
* Isolated Systolic Hypertension	> 140	and	< 90

Nutritional Management of CVD

Diet Modification

- Healthy eating patterns
- Balanced diet

Alcohol intake

- Limiting to 1/day for women and 2/day for men

Weight Management

- Aim to lose weight if BMI is 25kg/m^2

Essentials of Nutrition Management for CVD

Clinical Management Of CVD

- Diagnostics Tools
  - Electrocardiogram: Measures the electrical activity of the heartbeat
  - Lipid Profile: Screening & Management of Lipid Levels
- Pharmacological Management
  - Statins
  - ACE inhibitors
  - Beta-blockers
  - Diuretics

GOALS OF CVD NUTRITION THERAPY

1 Attain and maintain optimal metabolic outcomes including

a) A lipid and lipoprotein profile for the management of CVD.

b) Blood pressure levels that reduce the risk for vascular disease and CVD.

c) Blood glucose levels in the normal range or as close to normal as is safely possible to reduce the risk for CVD.

d) Homocysteine levels in the normal range or as close to normal as is safely possible to reduce the risk for CVD.

e) C-reactive protein levels in the normal range or as close to normal as is safely possible to reduce the risk for CVD.

2 Prevent & treat complications

- Prevent and treat the chronic complications of CVD. Modify nutrient intake and lifestyle as appropriate for the prevention and treatment of obesity and hypertension.

3 Food Choices & Physical Activity

- Improve health through healthy food choices and physical activity

4 Address Individuals Needs

- Address individual's nutritional needs taking into consideration personal and cultural preferences and lifestyle with negotiation with client.

GOALS OF CVD NUTRITION THERAPY

REPUBLIC POLYTECHNIC

1 For children and adolescents

- For children and adolescents with congenital heart failure, to provide adequate nutrition to ensure normal growth and development and preserve social and psychological well-being

2 For older adults

- To provide for the nutritional and psychosocial needs of an aging individual.

3 For individuals at high risk for CVD

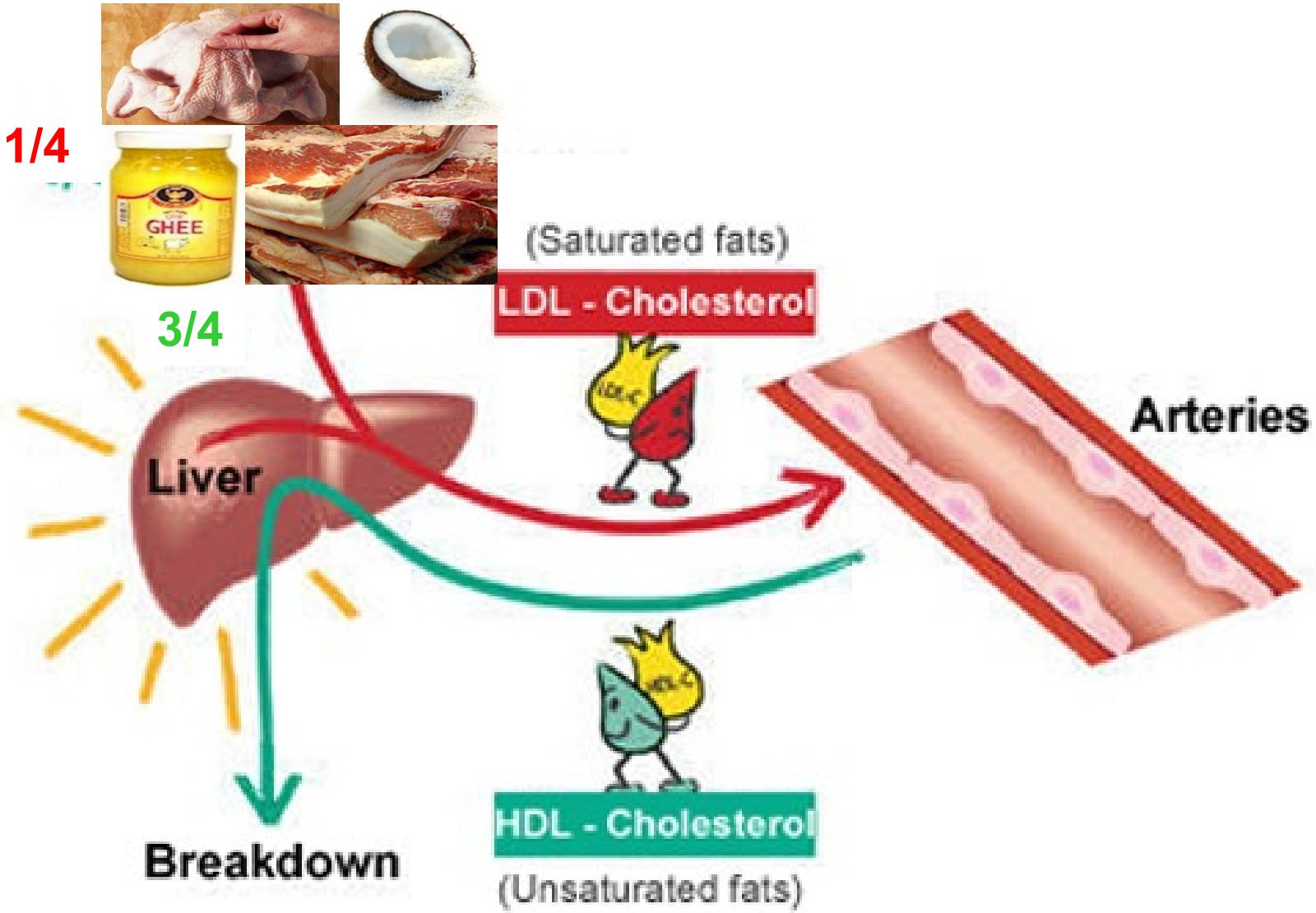
- Encouraging physical activity, managing blood lipid and or glucose levels (if he/she has DM), and promoting food choices that
- facilitate moderate weight loss or weight maintenance will help to reduce risk.

Education For Cardiovascular Diseases

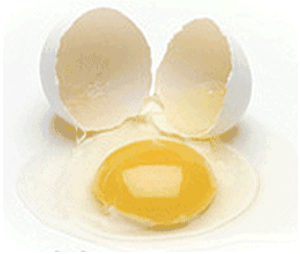
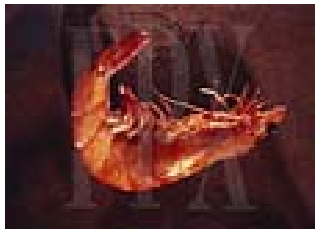
Practical Healthy Eating Tips on Cholesterol intake

1. Diagnosed CVD – not more than 200mg of cholesterol intake per day.
2. Daily recommended dietary cholesterol intake – not more than 300mg/day.
3. Limit egg yolk intake ≤ 5 per week
4. Limit intake of seafood and animal internal organs
5. Limit the intake of lean meat to no more than 2 palm sizes a day
6. Remove these before eating
   - ➢Prawn head
   - ➢Seafood (crab, fish, prawn and etc) roe

Hyperlipidaemia & Diet



Cholesterol Content of Food

 Hen egg yolk - 1076	 Maw, ox- 15	 Prawn w head - 74	 Crab - 69
 Brain, pig – 800	 Kidney, ox - 320	 Prawns w/o head - 54	 Cuttlefish - 111
 Liver, chicken - 336	 Anchovies w/o head - 193	 Cockles – 45	**Source:** ***Nutrient Comp of Malaysian Foods, IMR, 1997***

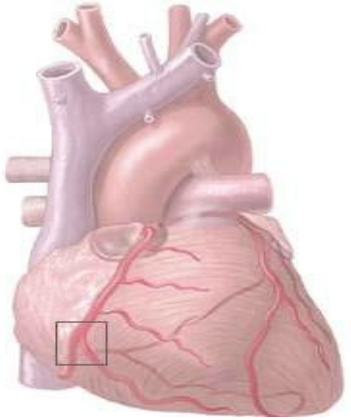
Why Reduce Fat Intake?(especially Saturated FAs)?

REPUBLIC POLYTECHNIC

↑ blood sugar level

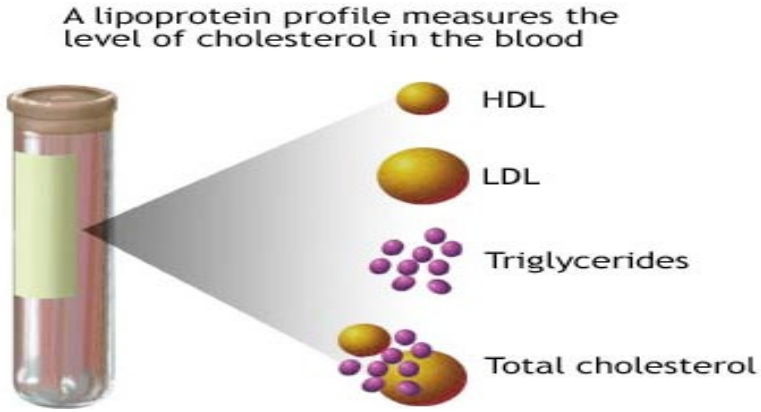
↑ risk of getting heart attack

Blockage in right coronary artery



Weight management

Affects blood lipids



Reference: Thomas B., 2001, 'Manual of Dietetic Practice', 3rd edn, Blackwell Science Ltd., United Kingdom

What is *DASH Diet*?

Dietary ***A***pproaches to ***S***top ***H***ypertension

Strives for…..

- Low saturated fat, cholesterol, and total fat intake
- Significant increase in fruits, vegetables and low fat dairy products intake;
- Limiting by 1/3 the usual intake of beef, pork and ham;
- Eating half the typical amount of fats, oils and salad dressings;
- Eating ¼ the number of snacks and sweets.

➔ **Rich** in potassium, calcium, magnesium, fibre, and protein.

DASH diet

- The DASH diet is based on National heart, Lung & blood institute studies that examined three dietary plans and their results.
- DASH plan incorporated fruits and vegetables, low fat or non-fat dairy, beans, and nuts.
- The DASH diet is also reduced in red meat, sweets, and sugar-containing drinks.
- The diet reduced systolic blood pressure by 6 mm Hg and diastolic blood pressure by 3 mm Hg in patients with normal blood pressure. Those with hypertension dropped by 11 and 6, respectively.

DASH Diet

To increase
■ Wholegrains
■ Fruits & Vegetables
■ Low Fat Dairy
■ Fish
■ Lean Poultry
■ Nuts

To reduce
■ Red meat
■ Sweets
■ Added Sugars
■ Sugar containing beverages
■ Sodium intake

Fruits & Vegetables with Higher Potassium Content

Fruits:

Avocado

Banana*

Chiku

Dates

Grapes*

Honeydew

Jackfruit

Kiwi*

*Also high in magnesium

Vegetables:

- Broccoli*
- Dark green leafy- Kai Lan, Spinach(bayam), Chye Sim etc.*
- Potatoes*
- Chinese Cabbage
- Fungus-all types

Recognizing the Risk Factors

- Diabetes, lipid disorders, cardiovascular diseases, hypertension and stroke are all unique conditions
- Each with their own etiology and progression.
- BUT, share many common modifiable lifestyle risk factors such as an unhealthy diet, physical inactivity, smoking, stress and alcohol consumption.

Quiz

Click the **Quiz** button to edit this object