PUBLIC HEALTH GUIDELINES
for Disease Prevention
Diabetes, Coronary Heart Disease and Cancer

Nutrition Division
Ministry of Health Nutrition & Indigenous Medicine
2017

Foreword

Non communicable diseases (NCDs) are escalating health problems in Sri Lanka. Coronary heart disease has the highest death rate among overall mortality. Prevalence of diabetes is also drastically increasing while reaching more towards younger generation in the country. Cancer in Sri Lanka is steadily on the rise. Statistics shows increasing number of cancers as well as death rates from cancers.

Reducing major risk factors for non communicable diseases, unhealthy diet, physical inactivity, tobacco use, beetle chewing and alcohol abuse is the key focus to prevent long term suffering and deaths from most of the non communicable diseases.

Coronary heart disease, diabetes and cancer place a heavy burden on health economy and health care systems.

Most NCDs are preventable as they are caused by mostly by modifiable risk factors. Proper disease management can prevent suffering of patients, complications of the diseases and unnecessary health budgets of managing complications.

Therefore awareness of general public on major non communicable diseases, their risk factors and preventable strategies is the key for prevention of NCDs.

I hope that the document " Public health guidelines for disease prevention – Diabetes, Coronary heart disease & Cancer" will fullfill this task.

Dr. P.G. Maheepala
Director General of Health Services
Ministry of Health, Nutrition and Indigenous medicine

Preface

Ministry of health has identified an increasing trend of non communicable diseases (NCD) such as diabetes, coronary heart disease and cancer which are major public health problems in Sri lanka. Major behaviour change toward healthy life style and enhance health promotion of individuals has been identified as some key strategies which can be successfully implemented to reduce the NCD burden in Sri Lanka.

Nutrition and food are the most important contributory causal factors to develop NCD during the life course of an individual. Nutrition division has taken an effort to introduce the evidence based, scientific knowledge and best practices to the Sri lankan people on nutrition and food with the aim of reducing NCD burden in our population.

This publication aims prevention of diabetes, coronary heart disease and cancer. It is a user friendly comprehensive document for health staff and general public.

I take this oppertunity to convey gratitude to all the staff in Nutrition Division who made this work a success.

Dr. L.B.H. Denuwara
Director / Nutrition
Ministry of Health

Contents

Diabetes

What is diabetes?

Diabetes mellitus is a group of metabolic disease characterized by high blood glucose (hyperglycemia) resulting from defects in insulin secretion, insulin action or both.

Chronically elevated blood glucose is associated with long term damage, dysfunction and failure of various organs especially the eyes, kidneys, nerves, heart and blood vessels.

Facts behind diabetes

Starchy foods and sugars (carbohydrates) that we ingest are broken into a simple sugar called glucose during digestion. Glucose gives energy. Insulin, a hormone produced by pancreas helps uptake of glucose in to the body for cellular function.

In diabetes mellitus, either the body can't produce enough insulin or body is resistant to insulin or combination of both can happen resulting high blood glucose levels for a prolonged period, as blood glucose cannot be absorbed by body cells.

There are two types of diabetes

1. Type I diabetes:

It is an auto- immune condition attacking pancreas with an individuals own antibodies. The damaged pancreas cannot produce insulin. A person with type 1 diabetes has to take insulin throughout the life. Serious medical complications can occur with time unless the patients are properly managed throughout.

2. Type II diabetes:

This is the most common type of diabetes accounting for 95% of cases in adults. This is usually an adult onset disease mostly seen among overweight and obese people. Teenagers especially who are overweight or obese are also at risk of developing type II diabetes.

What are the symptoms of diabetes?

Some diabetic patients can be asymptomatic and can be diagnosed by a blood test only. Others may present with one or more symptoms.

- Increased thirst and frequent urination – Excess glucose building up in blood causes fluid to be pulled out from the body tissues. This may make you thirsty, resulting excess drinking and urination.

- Increased hunger – In spite of high glucose in blood, without enough insulin, sugar cannot be moved in to the cells of the body. This results fasting of cells. Your muscles and organs become depleted of energy which triggers intense hunger.

- Weight loss - As body tissues are not getting enough sugar/energy due to lack of insulin, the body uses alternative energy stored in muscles and fat. This can result weight loss.

- Fatigue – In spite of having food, your cells are deprived of sugar. You may become tired and irritable.

- Blurred vision – If your blood sugar is very high, fluid may be pulled out from the lenses impairing the ability to focus.

- Slow healing sores and frequent infections – diabetes can affect your immune system, making you susceptible for infections.

- Areas of darkened skin – some people with diabetes have patches of dark velvaty skin in the folds and creases of their bodies.

- Itching, skin infections, feeling dizzy, leg cramps, headaches, mood changes– these symptoms are not uncommon.

If you are having one of these symptoms, check your blood for diabetes.

What are the risk factors for diabetes?

Several risk factors have been associated with type II diabetes.

1. **Diabetes runs in families** – If your parent, brother / sister or close relative is a diabetic, your chances of getting diabetes are high. This could be due to genetics or unhealthy life style.

2. **Obesity or being overweight** – People whose body weight is more than 20% over their ideal body weight are particularly at higher risk of developing diabetes. If your BMI (body mass index) is more than 23, you are at risk of getting diabetes and risk increases as BMI rises.

$$\frac{(BMI = \text{ Weight in kg)}}{\text{Height}^2 \text{ in m}}$$

3. **Increased waist can make you diabetes** – increased waist is even more critically linked to diabetes than the overall increase in weight. If waist circumference is > 80 cm (>32 inches) in females or > 90 cm (>36 inches) in males is associated with increased risk of diabetes.

4. **Unhealthy diet can result diabetes** – nutrition plays a major role in the development of type 2 diabetes. It's important to have a balanced and healthy diet to make sure that the body is able to produce and use insulin as intended.

5. **If your triglycerides are high** – If your triglyceride levels are high (mostly over 250mg/dl) and /or HDL (good cholesterol) level is low (less than 35mg/dl), you are at risk of diabetes. A healthy eating plan, sufficient physical activity and a healthy weight can help improve abnormal lipids.

6. **If you are not physicaly active** – If you are not physically active, your chances for diabetes is high. Lack of exercise is common in modern times and change of life style to increase exercise is essential and recommended for all. Achieving at least 150 minutes per week of moderate intensity aerobic physical activities or 75 minutes per week of vigorous intensity aerobic physical activity or a combination of both with muscle strengthening at least 2 days per week is beneficial.

7. **Stress can make you diabetes** – Research evidence suggests that stressful experiences have an impact on both onset of the disease and exacerbations. Interventions that help individuals prevent or cope with stress can have an important positive effect on glycemic control and quality of life.

8. **Diabetes increses with age** – The risk of type 2 diabetes increases with the age as the body finds it difficult to produce adequate amount of insulin to normalize blood glucose levels. If you are 45 years or older, chances of getting diabetes increases.

9. **Heart disease & high blood pressure** – People with coronary heart disease or hypertension have a higher chance of getting diabetes.

10. **Gestational diabetes** – If you have developed diabetes during pregnancy, your risk of getting diabetes in future increases.

11. **Poor nutrition during pregnancy** – Under nutrition during pregnancy can increase the risk of insulin resistance in the child, while over nutrition can lead to being overweight and obese resulting in early development of type 2 diabetes.

12. **Polycystic ovarian syndrome (PCOS)** – Women with PCOS have a higher chance of getting diabetes.

What is pre diabetes?

A person with pre diabetes has blood sugar levels higher than normal, but not high enough for a diagnosis of diabetes. A person with pre diabetes is at a higher risk for developing type II diabetes and other serious health problems including heart disease/ stroke. 15% to 30% of people with pre diabetes will develop type II diabetes within 5 years, unless they make lifestyle changes such as dietary modification and increasing physical activity.

Research shows that if you are pre diabetic, losing 5% to 7% of your body weight and engaging at least 150 minutes each week of physical activity can help to prevent or delay type II diabetes. Pre diabetes can often be reversed.

Investigations

1. **Fasting Blood Glucose (FBG)** – this test measures the level of glucose in the blood after an 8 – 12 hour fast.

	Fasting glucose level
Normal fasting glucose	– From 70 to 99 mg/dl
Prediabetes (impaired fasting glucose)	– From 100 to 125 mg/dl
Diabetes	– 126 mg/dl and above on more than one testing occasion

2. **Haemoglobin A1c** – An A1C is a blood test which can estimate average blood sugar level over the previous two to three months. Periodic test of A1C will help controlling blood sugar and to prevent complications associated with diabetes.

   A1c level

Normal	– Less than 5.7%
Prediabetes	– 5.7% to 6.4%
Diabetes	– 6.5% or higher

3. **2-hour glucose tolerance test (OGTT)** – After receiving a fasting blood sugar test, person receives 75g of glucose by mouth and blood samples are taken at specific intervals, over a period of two hours.

   **Glucose level 2 hours after 75 g glucose drink**
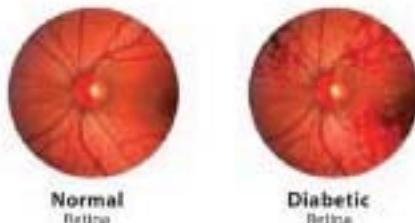
Normal glucose tolerance	– Less than 140 mg/dl
Prediabetes	– From 140 to 199 mg/dl
Diabetes	– Equal to or greater than 200 mg/dl
	On more than one testing occasion

4. **Post prandial blood sugar test (PPBS)** – This test measures blood glucose exactly 2 hours after eating a meal. In healthy, nondiabetic subjects, 2-h postprandial blood glucose levels are usually <120 and rarely < 140 mg/dl. If it is between 140 – 199 mg/dl you are pre-diabetic and a 2-hour glucose level of 200 mg/dL or above indicates diabetes.

Diabetes has serious Complications

Long term uncontrolled blood sugar levels can lead to serious complications. This can damage the eyes, kidneys, nerves and blood vessels.

a. Diabetes can make you blind

Normal
Retina
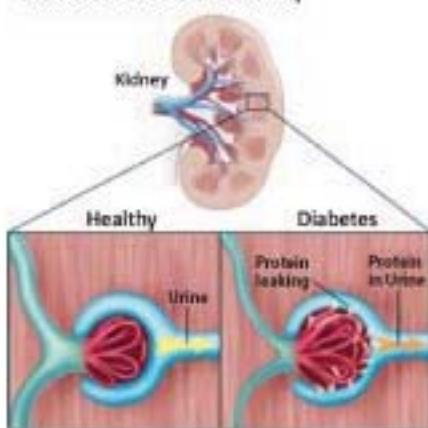
Diabetic
Retina

Long term diabetes probably more than 5 years can damage small blood vessels within the eye with various degrees of vision impairment which can even progress to total blindness.

All diabetics should periodically be examined by relevant experts for early recognition of eye problems.

b. Diabetese can damage your kidneys

Diabetes Affects the Kidney

Kidney

Healthy

Diabetes

Urine

Protein leaking

Protein in Urine

Long term diabetes can damage small blood vessels of kidneys with leakage of protein in the urine. The onset of kidney disease and its progression is extremely variable.

Progressive kidney damage can end up with end stage renal disease (total renal failure) which needs to be treated with long term dialysis or kidney transplantation.

c. Diabetes destroy your nerves

Small blood vessels supplying nerves can get damaged due to chronic diabetes. This can lead nerves get damaged due to impaired blood supply.

Symptoms of neuropathy include pins tingling and needle sensation in the hands, electrical shocks, numbness, burning, stabbing and aching of the feet and lower extremities. This can end up with complete loss of sensation in the feet favoring injuries to the feet.

Neuropathic pain can range from annoying to debilitating or even can intolerably painful which worsons at night.

d. Diabetes affect sexual function

Poor blood flow to the penis due to the damage of blood vessels and nerves can impair erection of penis.

e. Diabetics are more prone to heart disease & stroke

Patients with diabetes are more prone to get atherosclerotic heart disease which accounts for approximately 50% of all deaths in industrialized countries as well as the commonest cause of death in Sri Lanka. Diabetics are more prone to develop strokes than non diabetics.

f. Take care of your feet

Due to the atherosclerotic changes of blood vessels and damaged nerves supplying the feet, blood supply to the feet will be impaired leading to ulceration and subsequent amputation of limbs (diabetic foot disease).

Treatment

There is no cure for diabetes once developed. Blood sugar levels can be controlled by maintaining ideal body weight or BMI with balanced diet and physical activity. Oral medications and or insulin may be required for the management of blood glucose.

Insulin is the main treatment in type 1 diabetes supported by life style, dietary and weight management.

Type II diabetes can be controlled by dietary management, physical activity and exercise with or without oral medications and or insulin.

Prevention

Diabetes is a chronic and costly disease with serious complications which is common especially in developing countries and among poor. Therefore prevention is of utmost priority.

Large population studies suggest even moderate reduction in weight and only half an hour walking each day in overweight people with mild glucose intolerance can reduce the incidence of diabetes by more than half.

a. Lose extra weight

Excess weight is one of the most important cause of type II diabetes. Obese person is 20 -40 times more likely to develop diabetes than a person with healthy weight. If you are overweight, reducing 5% -10% of your body weight helps to bring blood sugar back to normal.

Limit your portion size, cut calories, limit high fat food (especially saturated) and carbohydrates. Eat a wide variety of vegetables, fruits, lean protein and whole grains.

Research evidence suggests that a moderate increase in dietary protein in association with physical activity and an energy controlled diet may improve the regulation of body weight by weight loss.

Successful weight loss occurs most frequently when a nutritionally adequate diet that allows caloric deficits (500kcal /d for each lb lost per week) is tailored according to individual food preferences. A minimum of 1200 kcal/d for women and 1500 kcal/d for men should be provided.

b. Make exercise a habit

Leading an active life is a must for a healthy life. Aim for 30 minutes aerobic activity 5 days a week and strength-training exercise at least twice a week.

Regular physical activity gives you many benefits.

- Lose your weight
- Lower your blood sugar
- Boost your sensitivity to insulin

What kinds of physical activities are the best?

1. Activities like walking, climbing stairs, moving around throughout the day
2. Aerobic exercises such as brisk walking, swimming or dancing, using cardio machines at gym/home
3. Strength training like lifting light weights
4. Flexibility exercises such as stretching

Aerobic exercises:-

This stimulates the heart rate and breathing rate to deliver oxygen fast to working muscles to keep you moving. Aerobic exercise makes your heart strong and improves blood circulation. It also helps to make bones strong. It lowers the risk for type II diabetes, heart disease and stroke by keeping your blood pressure, blood sugar and lipids within normal limits.

Strength training:-

This helps build strong bones and muscles and makes everyday chores easier. Here are some ways of strength training. Lift light weights at home; join a class that uses weights, elastic band s or plastic tubes.

Research indicate that strength training helps to control blood sugar and insulin action in even patients with diabetes. An increase in muscle mass due to regular strength training increases blood glucose uptake by muscle masses as well as prevent loss of skeletal muscles by disuse or aging.

Flexibility exercises:-

Stretching keep your joints limber and lower your chances of getting joint pain.

Modify your diet

- Reduce the quantity you eat. Starchy foods like rice, yams, cereals, jack fruit once digested, release sugar (glucose) to the blood stream. Smaller portions deliver less sugar to the blood stream.

- Drinking a glass of water 10 minutes before your meal, make you feel less hungry.

- Eating slowly makes you eat less food. It takes 20 minutes for the stomach to send a signal to the brain that stomach is full. Therefore spend at least half an hour for dinning.

- Using a small plate will help to feel a full plate satiety with small quantity of food.

- Plate should not be filled with rice only. Instead it can be filled a half with vegetables, a quarter with grains and rest of the quarter with proteins (fish, eggs etc.)

- People should not eat till they feel stomach full. They should stop eating before that. Once they finish the dessert (fruits)and a glass of water finally will help to feel full

- Consuming fruits before main meal or in between main meals may help to further reduce quantity of starchy food consumed.

1. Choose whole grains:

Latest research indicate that diet rich in whole grains protect people against diabetes whereas diet rich in refined carbohydrates increase the risk. The bran and fiber in whole grains make more difficult to break down starches by digestive enzymes. Therefore blood sugar increases slowly with whole grains (low GI). Whole grains are also rich in various vitamins, minerals and phytochemicals which help in reducing the risk of diabetes.
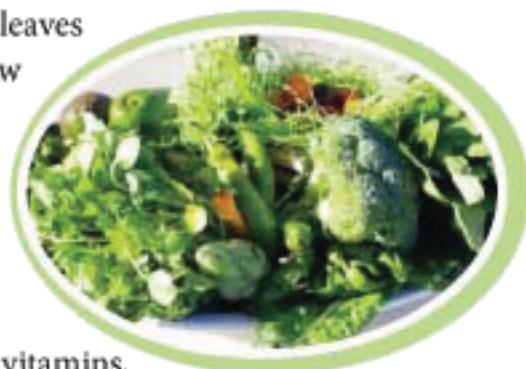
Refined grains like white rice, white bread, sweetened drinks sugary foods like cakes, donuts, honey and jaggery when digested; give rise to high levels of blood sugar within a short period (high GI). Therefore consumption of these foods should be limited as they contribute to obesity, high triglycerides and diabetes.
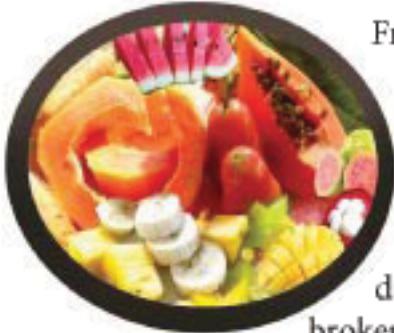
2. Eat plenty of vegetables

Most of the vegetables and green leaves contain high levels of fibres and low calorie levels. Therefore consumption of plenty of vegetables helps in losing weight and weight management. Fibres reduce absorption of sugars to the blood stream.

Vegetables and green leaves are rich in vitamins, minerals, antioxidants and phytochemicals which are helpful in prevention of diabetes. Having a variety of vegetables and fruits can give you full of micronutrients needed.

## 3.	2 or 3 servings of fruits for a day.

Fruits contain lot of fibers, vitamins, minerals, antioxidants and phyto chemicals which are important in prevention of diabetes. Therefore eating variety of fruits helps in prevention of diabetes. Fresh fruits or cut pieces are better than fruit juices because during preparation of fruit juices, fibers are broken down.

If you choose to drink juice, select 100% juice with no added sugar. Discourage heavy fruit drinks, beverages with lesser percentage of fruits. Limit the quantity of 100% juice to <200 ml a day. Increased regular consumption of fruit juice may increase the risk of develping diabetes mellitus as it contains fair amount of natural sugars and it can be quickly absorbed to the blood stream. Therefore people with high risk of diabetes, should select whole fruits instead of juices.

In addition to sweetened drinks, two or more servings of natural fruit juices carry a higher risk of diabetes.

As most of the Sri Lankan varieties of fruits contain lot of natural sugars, people with normal body weight and low risk of diabetes can have fare amount of fruits for a day whereas people with overweight or higher risk of developing diabetes have to limit consumption of fruits up to 2 to 3 servings a day. Fruits almost ripened but not fully ripened are the best for people with diabetes or higher risk, as they contain less sugar. There are many Sri Lankan varities with low sugar e.g.veralu, nelli, guava, jambu, uguressa, lovi, star fruit, madan etc. They can be cosumed with much freedom.

## 4.	Consume fish and plant proteins adequately but less meat

Latest research indicates that red meat (beef, pork, and goat) and processed meat increase the risk of diabetes.

Higher meat consumption irrespective of its fat content increases the incidence of diabetes.

Plant based proteins provide quality proteins with healthy fats and high fibres. Quality of the proteins can be further increased using more than one plant based protein for a day. Therefore plant proteins like lentils, grams & green grams etc are the best options for preventing diabetes.

Fish, especially oily fish tuna, hurulla, balaya, salaya contains healthy oils – omega 3 fatty acids which help in prevention of chronic diseases including diabetes. Consuming fish on regular basis will be very important to be healthy.

Eggs – a power house

Egg has the highest quality of protein with all the essential amino acids. Egg also can serve as a source of vitamins and minerals. Egg is a power house of disease fighting nutrients like lutin and zeaxanthin. Latest research indicates that high levels of egg consumption (daily) are associated with an increased risk of type II diabetes. Therefore consumption of 2 -3 eggs per week is recommended for diabetics and people with high risk of diabetes where as an egg a day for heathy Childres & adults.

Consume milk products daily

Use milk and milk products daily. Although milk is not essential, it is a wholesome food with good source of energy, proteins, vitamins and minerals.

An adequate intake of milk products may reduce the risk of type II diabetes. Full fat dairy products appear to be not associated with diabetes. Low fat milk products appear to be consistently associated with a lower risk of diabetes.

A modest beneficial effect of cheese and fermented dairy products (e.g. yoghurt) has been identified by researches.

It is recommended to have 1-2 servings of milk or milk products daily.

Exclusive breast feeding up to six months and extended breast feeding up to 2 years reduces the risk of developing diabetes to the child in later life. Whereas early introduction of formula milk may increase the risk of diabetes.

5. Consume fat in moderation

Food containing saturated fat and total fat should be used in moderation as excess consumption can make you over weight & obese which favors you getting diabetes.

Research indicate that high intake of saturated fat contributes to type II diabetes.

Coconut and coconut oil contain saturated fat but their chemical structure is different to above fats. Coconut contains mostly medium chain fatty acids which can be easily burnt for energy.

Research indicates using small amount of coconut oil may help in increasing good cholesterol (HDL). Therefore coconut can be used in moderation. Using one coconut for a family of five will be sufficient for a day.

Unsaturated oils – fats in oily fish, gingerly, gingerly oils, avocado, cashew nuts, pea nuts and cottan can help prevent you getting diabetes when used in moderation.

Trans fats

Consumption of food containing trans fats in long run can bring you many diseases including diabetes. When unsaturated oils like palm oil and margarines are heated in to high temperatures, their double bonds can break forming trans fatty acids. Baked products with unsaturated oils may have high levels of trans fat.

eg. Short eats – pastries, cakes, biscuits etc.

Repeated frying specially with unsaturated oils can produce trans fats.

Therefore it is advisable to avoid using foods with high levels of trans fats.

d. Quit Smoking

There is a positive association between smoking and risk of developing type II diabetes. Therefore abstinence from smoking helps in prevention of diabetes.
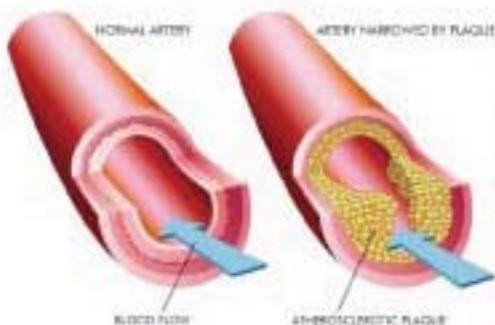
e. Abstain from Alcohol

Lifestyle abstainers as well as people consumed alcohol (Alcohol Consumption) in moderation are associated with relatively lower incidence of diabetes where as consuming higher quantities of alcohol increases the risk of diabetes regardless of drinking frequency.

f. Sleep well

People who sleep 7-8 hours per day have the lowest risk of diabetes whereas both long and short durations of sleep are associated with increased risk of diabetes.

ATHEROSCLEROSIS

NORMAL ARTERY   ARTERY NARROWED BY PLAQUE

BLOOD FLOW   ATHEROSCLEROTIC PLAQUE

CHAPTER 2
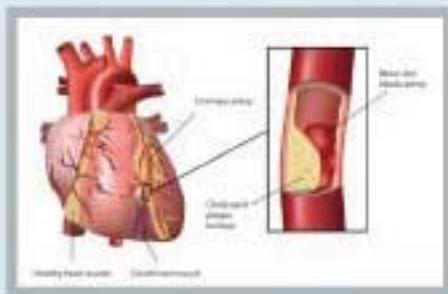
Coronary Heart Disease

What is vascular (coronary) heart disease?

The heart contains muscles. Heart muscles like any other muscles in the body require adequate oxygen rich blood supply to allow the muscle to contract and pump blood. Heart muscles are supplied blood by small blood vessels called coronary arteries. When coronary arteries are narrowed or blocked, the blood supply may be insufficient causing a pain or discomfort over the chest.

Narrowing of blood vessels can happen due to fatty deposits inside the lumen. This is called atheroma and this process is called atherosclerosis. When the coronary arteries are blocked by atheroma / fatty deposits causing insufficient blood supply to the heart, this condition is called angina or coronary heart disease.

What is heart attack?

These narrowed coronary arteries can be completely blocked by a blood clot. This is called a heart attack or myocardial infarction. In heart attack, as the blood vessel is completely blocked, the tissues of the heart supplied by the blood vessel can die due to absence of blood supply and hence oxygen.

What are the symptoms of coronary heart disease (CHD)?

The most common symptom of coronary heart disease is chest pain. The type of pain can be different from person to person. Pain can be felt as heaviness, a discomfort,a pressure on the chest, aching, burning, fullness, squeezing or any abnormal feeling in your chest, shoulders, neck, arms, throat, back or jaw. Some people may feel it as shortness of breath, palpitations, a faster heart beat, a sweating episode, nausea or dizziness as well.

Heart attacks can occur without chest pain or any other symptoms. Heart disease without symptoms is common in type II diabetes. Ischemic pains (pain due to low blood supply to heart) are common during exercise/exertion, eating, excitement/stress or exposure to cold. When coronary arteries are severely blocked/ narrowed, ischemic pain can occur even at rest.

How do I know whether my blood vessels are blocked or do I have angina / CHD?

An Electrocardiogram (ECG) can show signs of ischemia or signs of previous heart attacks. Some people with angina, may have normal ECG especially when they are not in pain. Therefore a stress test is needed to diagnose angina.

During stress test, you have to undergo an exercise such as jogging/running in the tread mill for a certain period. A stress test or exercise ECG can show possible signs and symptoms of angina such as abnormal changes in stress ECG, increased blood pressure, shortness of breath or chest pain.

If the stress test is positive for angina, what is my next step?

Your doctor may recommend you to undergo a coronary angiography. A dye is injected to your blood vessels to identify blocked blood vessels in your heart.

How is a heart attack diagnosed?

1. **ElectoCardioGram (ECG)**

   Certain changes occur in ECG following a heart attack. A doctor can diagnose heart attack by reading the ECG. Therefore any person with suggestive symptoms of heart attack should undergo an ECG test immediately.

2. **Blood tests**

   Cardiac enzyme levels of your blood can be checked by a simple quick blood test. Troponines are proteins found inside of heart cells. During the heart attack, these proteins are released to the blood supply by damaged heart muscles. Troponin levels of blood can be checked by a quick blood test. Detecting troponin in the blood may indicate a heart attack.

What steps should we take following a heart attack?

Heart attack or myocardial infarction is a medical emergency. Patients with heart attack can die immediately, even prior to the treatment. Therefore attending medical treatment immediately by a nearby hospital is a must. Taking one asprin tablet before going to hospital is prudent.

The goal of drug therapy is to break up blood clots, facilitating blood supply to the heart muscles. This will help to decrease the amount of damage to the heart muscles. Asprins and clopidogrels are anti-clotting

agents. They can help to dissolve blood clots in the blood vessels of heart.

If you are a known patient with angina, you may be having these drugs at your reach. You can use this medicine immediately even before attending to the doctor. After attending to the hospital, doctors will further analyze your condition and will attend for other procedures for establishing blood supply to the heart.

How can I prevent getting coronary heart disease or angina?

You can prevent/delay getting heart disease by avoiding exposure to known risk factors.

What are the risk factors for ischemic heart disease?

Any person has a risk of getting heart attack or coronary heart disease parallel to their aging process, but certain conditions or habits can increase your risk of getting heart disease. These are called risk factors.

Non modifiable risk factors

Certain risk factors cannot be controlled for reducing the risk of getting heart disease.

1. **Age:** - risk of Heart disease increases with age as the heart walls as well as blood vessels may stiffen and harden with age. In men, the risk for CHD increases starting at age 45. In women, the risk for CHD increases starting at age 55.

2. **Gender:** - Men has increased risk of cardio vascular diseases than women. Women are usually protected from heart disease because of their sex hormones but after menopause, risk of heart disease increases.

3. Family history: - Heart disease tends to run in families. If your parents or siblings had a history of heart attack or stroke before the age of 55 years, then you are at greater risk for heart disease than someone without that family history.

Modifiable risk factors

The majority of heart disease is caused by risk factors that can be controlled, treated or modified. Such as

1. High blood pressure
2. Smoking
3. Diabetes
4. Physical inactivity
5. Being overweight or obese
6. High blood lipids
7. Stress

More risk factors you have, the greater your chance of developing Heart disease. Greater the level of each risk factor, the more that factor affects your overall risk.

1. High blood pressure (Hypertension)

Research indicates a strong and consistent link between hypertension and CHD.

High blood pressure is defined as a systolic pressure at or above 140 mmHg and or diastolic blood pressure at or above 90 mmHg. Systolic blood pressure is the maximum pressure in the arteries when the heart contracts. Diastolic pressure is the minimum pressure in the arteries between the heart contractions. When your blood pressure is more than 140/90 mmHg, you need medical follow-up by a qualified doctor.

What are the symptoms of hypertension?

High blood pressure is a symptomless condition and it can be diagnosed only by checking your blood pressure. Don't make the mistake of waiting till the symptoms will alert you on high blood pressure, as it is considered as a silent killer.

What are the dangerous limits?

When systolic blood pressure readings rise to 180 mmHg or above systolic or 110 mmHg or above for the diastolic is considered as a medical emergency, requiring urgent medical attention.

How high blood pressure affects your heart and blood vessels?

Hypertension is a risk factor for coronary heart disease and the single most important factor for stroke. It causes 50% of ischemic strokes and increases the risk of hemorrhagic stroke.

When the blood pressure is high, the force exerted on arteries creates microscopic tears within the artery wall. These tears later turn in to scars in artery walls. This scar provides a lodging place for accumulating circulating materials such as cholesterol, platelets and fats etc. within the damaged blood vessels. This is called a plaque.

The arteries slowly get narrowed and harden over time. There is a greater risk of developing blood clots and further blocking the blood vessels by a blood clot. When the blood vessels of heart are affected, coronary heart disease develops. When blood vessels of brain are affected, a stroke will result.

Damaged blood vessels cannot provide adequate blood supply to the important organs of the body (e.g. kidney), so these organs may fail to function properly as well in hypertensive patients.

2. Cessation of smoking

Smoking is one of the leading risk factor for heart disease, heart attack (MI) as well as stroke. Smoking influences building up of a plaque in arteries which eventually leads to hardening and blocking of the arteries (atherosclerosis). Smoking damages the organs as well as reduces good cholesterol (HDL). It also increases blood pressure. Thus smoking affects the body in multiple ways to increase risk of cardiovascular diseases.

Passive smoking

People should avoid exposure to passive smoking when others smoke which is dangerous as same as active smoking. Research evidence suggests that regular exposure to passive smoking at home or work increases the risk of heart disease specially among non smoking women.

Benefits of cessation of smoking are seen in former smokers even after many years of heavy smoking. Persons with already diagnosed coronary heart disease, experience as much as a 50% reduction in risk of re infarction, sudden cardiac death and total mortality, if they quit smoking after the first heart attack.

Training of health professionals

Smokers clearly value health care givers advice, their counseling and efforts for helping to quit smoking. A patient centered approach where the patient equally contributes is the best method for helping to quit smoking. Therefore doctors as well as other health providers should help smokers to quit and should make aware on health effects of smoking. Awareness programs should be conducted targeting school children and youth on health risk and addictive qualities of smoking.

3. Diabetes

Diabetes can cause heart disease. If you have diabetes, you are two to four times more likely to develop coronary heart disease than people without diabetes.

People with diabetes develop atherosclerosis at a younger age and progress severely than non diabetics. Uncontrolled diabetes cause damage to blood vessels making them more prone to get damaged from atherosclerosis and hypertension.

People with diabetes are more likely to develop a heart attack or stroke than people without diabetes. As diabetes can damage nerves as well as blood vessels, diabetic patients may not feel the typical chest pain, when they get a heart attack (silent heart attack).

Diabetic patients have a two to three fold greater risk of heart failure than non diabetics.

How can I avoid getting heart disease when I have diabetes?

By controlling your blood sugar levels and keeping them within normal range can reduce the risk of developing heart disease and the risk of heart attack, stroke or death from cardiovascular disease . The HbA1c is an important test which will tell you whether your diabetes is well controlled.

4. Physical inactivity, Being overweight or obese

The world wide epidemic of over weight is due to imbalance between physical activity and dietary energy intake. Sedentary life style, unhealthy diet and consequent over weight and obesity markedly increase the risk of cardiovascular disease.

Regular physical activities 45 – 60 minutes per day prevent unhealthy weight gain and obesity where as sedentary behaviors promote them. Regular exercise can markedly reduce body weight and fat mass without dietary calorie restriction in over weight individuals.

An increase in total energy expenditure appears to be the most important determinant of successful weight loss. Best long term results can be achieved by energy expenditure of at least 2500 kcal per week. Optimal weight reduction can be achieved by combination of regular physical activity and calorie restriction.

A minimum of 60 minutes, but most likely 80 – 90 minutes of moderate intensity physical activity per day may be needed to avoid or limit weight regain in formerly overweight or obese individuals.

It is important to develop strategies to increase habitual physical activity and prevent over weight and obesity in collaboration with communities, families, schools , work places, health professionals media and policy makers by a national level plan.

5. High blood cholesterol

Managing cholesterol can be delicious

You may surprise to know that cholesterol itself is not bad. Cholesterol is needed for many functions of the body. Only 20% of blood cholesterol level comes from your diet. The rest of the cholesterol is produced by liver.

Available evidence shows no appreciable relationship between consumption of dietary cholesterol and cholesterol in the blood. Consistent with American Heart Association (AHA) / American College of Cardiology (ACC) "cholesterol is not a nutrient of concern for over consumption".

Therefore cholesterol rich foods like eggs, whole milk, shrimps, and meat are no more concern as food with caution and can be consumed as healthy and safe. But too many servings of foods heavy with saturated fat and calories are a concern to avoid.

However when blood cholesterol rises, risk of CHD may rise. The risk increases even more with the presence of other risk factors.

What is total cholesterol?

Total cholesterol :- this is calculated using this formula.

Total cholesterol = HDL + LDL + 20% triglyceride level

What is Low Density Lipo-protein (LDL cholesterol)

This is considered as bad cholesterol. As it contributes to form hard deposits within the blood vessels resulting heart disease and stroke.

How do you reduce bad cholesterol (LDL) in your blood?

1. Limit your intake of foods full of saturated fats

Limit foods like butter, deep fried foods, bakery products, fatty beef, lamb, pork, poultry with skin etc.

2. Eat more fibre rich foods

Foods naturally rich in soluble fibre have proven particularly good at lowering cholesterol. Excellent sources of fibre are legumes and beans as well as yams, whole grains and oats. Fruits and vegetables are also rich in soluble fibre. A

fruit especially avocado is a good source of fibre, contains oleic acid which helps lower bad cholesterol (LDL). Avocado is a great source of heart healthy mono-unsaturated fat and cholesterol smashing beta-sitosterol, a plant sterol may help to increase HDL while lowering LDL.

3. Choose protein rich plant foods over meat

All types of beans and lentils are rich in soluble fibre which binds to cholesterol in the blood and moves out of the body. Therefore enjoying beans (soybean, mungbean, chickpea, cowpea etc.) and lentils (dhal) can reduce LDL levels in the blood.

Nuts and seeds such as cashew, peanuts, gingelly and pumpkin seeds, almonds, walnuts etc. contain poly and monounsaturated fatty acids, that have been proven to modestly lower LDL cholesterol. You can eat nuts right out of hand as a snack, at least 30 g per day. These plant sources are also rich in protein.

4. Ban trans fats

Trans fats raise your LDL as well as lower your HDL (good cholesterol). Trans fat mostly found in deep fried foods using unsaturated oils and baked goods.

5. Go fish

Try to eat fish 2 - 4 times a week. Omega 3 fatty acids in fish are heart healthy. Replacing red meat with fish will lower your cholesterol by reducing exposure to saturated fats.

6. Lose excess body weight

Losing excess body weight is beneficial for lowering your cholesterol as well as preventing many non communicable diseases (NCDs). Losing 10% of weight helps to lower LDL by up to 8% .

7. Take plant sterol supplements

Sterols are naturally occurring substances are found in plants. A daily intake of 1 – 2 grams of plant sterols has been found to lower LDL cholesterol levels.

8. Spice it up

Spices like garlic, curcumin, ginger, black pepper, coriander and cinnamon not only improve your taste but also helps to reduce cholesterol. Allicin is a compound found in garlic works as a potent anti-inflammatory and has been shown to help lower cholesterol and blood pressure levels. Adding garlic to your diet may help to improve your cardiovascular health.

- **Enjoy dark chocolate**

    Dark chocolate in moderation help lower LDL levels as it contains flavanoids, antioxidents etc. Make sure to eat in moderation as chocolate is high in saturated fat and sugar. Dark un-sweetened cocoa powder has similar health effects.

    Having cocoa or dark chocolate in moderation will help you to reduce risk of heart disease, blood pressure as well as stroke.

- **Grapes**

  Resveratol, a substance found in the red grape skin which may prevent damage to blood vessels by lowering LDL and reducing the risk of blood clots. Simply eating grapes or drinking grape juice is a better way to get resveratol.

- **Consume Soy products**

  Soy milk or tofu are high in protein and eating just 25 g a day can reduce cholesterol.

- **Have a green tea**

  Both black and green tea contains powerful antioxidents that may reduce cholesterol levels. Changing your sugary tea to a green tea can make a difference.

Triglycerides

Triglycerides are a type of fat (lipid) found in your blood. When you eat, your body converts any calories it doesn't need to use right away into triglycerides. In human body, high levels of triglycerides in the bloodstream have been linked to atherosclerosis and, by extension, the risk of heart disease and stroke.

Some people get excess triglycerides in their blood. How can they control triglycerides?

a) **loss weight**

Loosing 8 – 10% of body weight will reduce triglycerides by about 20%.

b) **Limit sugar or food & drinks with added sugar**

Individuals who consume lesser added sugar (less than 10% of daily calories) have the lowest triglycerides. It is recommended that only 5 % of your daily calories should come from added sugar. Therefore cut off sugar, sugary drinks and food with hidden sugar.

c) **Fill your plate with more fibre rich foods such as fruits, vegetables, pulses and whole grains.**

d) **Limit fructose**

Studies have showed that consumption of too much fructose leads to high triglycerides. Fructose that is found in natural fruits can increase triglycerides. Therefore people with high triglycerides should concern on their portion size and type of fruit.

e) **Eat fat in moderation**

Eat a moderately low fat diet. It is recommended that people with high triglycerides get about 25 – 35% of their calories from fat. Diets that are very low in fat are not as effective as diets moderately low in fat.

e.g. for an average person who consumes 2000 calories a day, 30% of 2000 calories are 600 calories. It gives 66.6 grams of fat (1 gram of fat gives 9 calories). Therefore person can consume 67 grams of fat for a day.

f) Watch the type of fat you eat

Cut off saturated fats which are found in butter, red meat and poultry fat. Replace trans fat with healthier mono and poly unsaturated fat sources.

g) Add fish to your diet

Fatty fish such as herring, salaya, bolla, tuna sp. are rich sources of omega 3 fatty acids. It is recommended to eat fatty fish twice a week. If you have high triglycerides, omega 3 capsules can be taken under your doctor's supervision.

h) Exercise

If you have high triglycerides, exercise at least 30 minutes of moderate intensity physical activity most days of the week which may lower your triglyceride levels.

i) Limit alcohol

Studies have linked even small amounts of alcohol can increase triglycerides. It is recommended that people with very high triglycerides avoid alcohol completely.

j) Take triglyceride lowering drugs

If your triglyceride levels are very high, your doctor may recommend a medication to lower your triglycerides.

What is good cholesterol? (High Density Lipoprotein, HDL)

This is considered as good cholesterol as it helps to remove LDL cholesterol from the arteries and send back to the liver. Healthy levels of HDL in the blood protect you from heart disease and stroke whereas low HDL levels increases risk of heart disease. Population studies have

shown that low levels of HDL cholesterol—less than 40 mg/dL for men and less than 50 mg/dL for women—increase the overall risk of coronary artery disease (CAD) and heart attacks.

How do you increase HDL?

- **Reduce extra weight**

  If you are overweight, reducing your weight even few kilograms can improve the HDL level.

- **Get more physical activity**
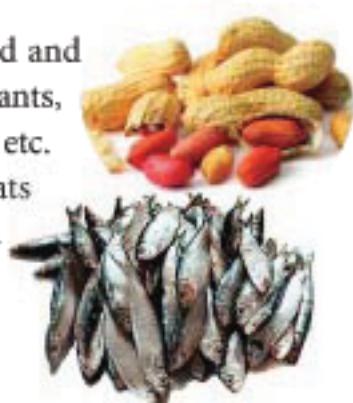
  Within two months of starting, frequent aerobic exercise can increase HDL. Exercising briskly for 30 minutes 5 days a week helps increasing HDL. Examples of brisk aerobic exercise include walking, running, cycling, swimming or any other thing that increases your heart rate.

- **Quit smoking**

  If you are a smoker, quitt smoking can increase your HDL levels.

- **Choose healthier fats**

  The healthier choices are monounsaturated and polyunsaturated fats. You'll find these in plants, nuts, and fish like salaya, tuna, hurulla, bolla etc. and keep your portion sizes appropriate. Fats pack a lot of calories in small amounts. Avoid trans fats which can lower HDL levels.

- **Cut your sugar intake**

  Many research found that the more calories that came from added sugar, the lower the HDL levels.

- Some medicines can lower LDL and increase HDL.

A lifelong approach

Many life style habits begin during childhood and long term exposure to risk factors increases the disease risk. Therefore parents and families should encourage their children to make heart healthy choices, since beginning of their lives and to avoid known risk factors at all possible times.

Life style changes are of course difficult targets but it definitely makes a difference in a healthy and happy family.

To achieve this, parents should learn about key health measures, information on Body Mass Index (BMI), waist circumference as well as knowledge on healthy diet and lifestyle. Parents also should be aware of their family members other risk factors such as blood pressure, cholesterol levels, blood sugar levels and should work on controlling/keeping them within normal limits.

Healthy life style

Following a healthy lifestyle reduces the risk of getting coronary heart disease

1. Healthy diet
2. Being physical active
3. Maintaining a healthy weight
4. Quitting smoking
5. Managing stress

Diet

Diet plays an important role in preventing heart disease. Research suggests that in spite of genetic predisposition, healthy diet can reduce the risk of heart disease. Most research has shown that a diet high in fruits & vegetables, whole grains and fish helps to prevent heart disease.

Certain foods should be avoided or limited which can worsen the risk of heart disease. This includes foods with high amounts of sugar, saturated fat, salt and alcoholic beverages.

Consume plenty of fruits & vegetables in various colours

Fruits and vegetables contain fibre, vitamins, minerals, antioxidents and phytochemicals all of which are helpful in prevention of CHD.

A well balanced diet should include at least 5 portions of fruits & vegetables a day. Plenty of vegetables and adequate fruits in various colours and variety improve the health. Fruits should be kept in places where family members can always see it. There is a compelling evidence that a diet rich in fruits & vegetables can lower the risk of heart disease & stroke. The higher the average daily intake of fruits & vegetables, the lower the chance of developing coronary vascular disease (CVD).

Individuals who eat more than 5 servings of fruits & vegetables had roughly a 20% lower risk of heart disease and stroke than individuals who eat less than 3 servings per day. Research has proven that diet rich in fruits & vegetables can prevent/ reduce blood pressure even in people with high blood pressure.

Fibre rich whole grains

Whole grain contain lots of fibre, vitamins, minerals, protein and complex carbohydrates. Fibres help reducing absorption of sugars and cholesterol and therefore whole grain are preferable in prevention of heart disease.

Picking your proteins

Replacing high fat protein sources with more heart healthy proteins like fish, pulses, legumes, skinless poultry and nuts help to prevent heart disease. Recent evidence suggests that an increase intake of protein, particularly plant protein may lower blood pressure and reduce the riskof heart disease.

Including soy protein in your diet helps to improve lipid profile in patients with abnormal lipid profile.

How much protein do I really need for a day?

Recommended daily allowances (RDA) depends on your age and weight. Growing children and pregnant as well as lactating mothers need more protein than normal adults. Centre for disease control and prevention recomends 10-35% of daily calories come from protein.

- choose the right kind and amounts of protein
- opt for low fat options- fish, skinless poultry, lean meats,skimmilk, legumes, pulses etc.
- prepare fish & meat in healthy way without adding saturated fat or trans fat.
- choose main dishes that combine meat and vegetables together.

Is fish good for heart?

Fish is a good source of protein as well as omega 3 fatty acids. Research has shown that omega 3 fatty acids decreases risk of arrhythmeas (abnormal heart beat) which can lead to sudden death.
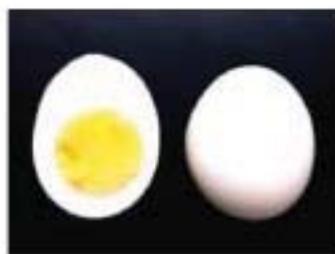
Omega 3 fatty acids help to decrease triglyceride levels in the blood, slow growth rate of atherosclerotic deposits in blood vessels as well as lower blood pressure slightly. It is recommended eating fish (particularly fatty fish) at least two servings a week. Each serving is 3.5 oz cooked or ¾ cup of flaked fish (at least 30 g daily). Fatty fish like mackerel, herring, salaya, bolla, tuna sp. (balaya, kelawalla) are rich sources of omega 3 fatty acids.

Consuming omega 3 fatty acids through foods is preferable for normal people. For people with coronary artery disease and people with high triglycerides, in addition to dietary sources supplements of omega 3 fatty acids can be used under doctor's supervision.

Eggs

Eggs are good source of nutrients. One egg contains 6 grams of high quality protein with all essential amino acids and is a good source of choline which has been linked with preserving memory and leutine and zeaxanthin which may protect vision.

Egg whites are rich sources of selenium, vitamin D, B6, B12, B2 and minerals iron, zinc and copper. Egg yolk contain fat soluble vitamins A,D,E,& K and lecithin.

An average large egg contains 212 mg of cholesterol, but according to many latest researches, higher consumption of eggs (up to 1 egg per day) is not associated with increased risk of heart disease. Increased risk of heart disease among diabetic patients were observed warranting further studies and therefore 2 -3 eggs per week can be recommended for diabetic patients.

Fats

Total fat consumption should be between 15 – 30% of total daily calories. The amount of saturated fat consumed should be below 7% of total calories for the day. Limiting the transfat to less than 1% of daily calories helps to prevent heart disease.

Our body naturally produces cholesterol. Eating food with high saturated fat and transfat raises blood cholesterol further (especially low density lipo-protein, LDL). High levels of LDL cholesterol in the blood increases the risk of heart disease.

Saturated fats naturally occur in many foods. Examples are beef, lamb, pork, poultry with skin, butter, cheese, lard & cream, whole milk and whole dairy products. Aiming for a dietary pattern that achieves 5-6% of calories from saturated fat will reduce the risk of getting heart disease.

For good health, the majority of fats that you consume should be monounsaturated and poly unsaturated fats. Mono and poly unsaturated fats can have a beneficial effect on your heart, when eaten in moderation and when use to replace saturated fat and trans fat in your diet.

Poly unsaturated fats can help to reduce bad cholesterol (LDL) levels in the blood and it has essential fatty acids which are essential for many functions in the body (omega 3 & 6). Sources of

poly unsaturated fats are fatty fish, cashew, peanuts, pumpkin seeds, kottang, and unsaturated oils such as sesame, soybean, olive oil etc.

Mono unsaturated fats also help to reduce bad cholesterol (LDL) levels and the risk of heart disease and stroke. Foods high in mono unsaturated fats are avocado, gingelley, oils of sesame, peanut, canola & olive. Most oils contain a combination of different fatty acids.

Transfats

There are two types of trans fat, naturally occurring and artificial trans fat. Naturally occurring trans fats are produced in the gut of some animals. Milk and milk products may contain small quantities of this.

Artificial trans fats are created in an industrial process. Hydrogen is added to liquid vegetable oils (unsaturated) to make them more solid. Therefore primary dietary source of trans fat is partially hydrogenated oils. Therefore when you buy food products (especially processed) look for "partially hydrogenated oils" in the ingredient list of food package and avoid buying.

Deep frying of food with unsaturated oils, produces trans fat. Repeated frying especially with unsaturated oils increases trans fat concentration in foods. Most of the fast food, baked products may contain trans fat. E.g. dough-nuts, pastries, cakes, biscuits, pizza, cookies, crackers ,some margarine and fat spreads.

The amount of trans fat can be determined by the label of packaged food. Select products with zero grams of trans fat.

How do transfats affect health?

Consuming food with trans fat can increase bad cholesterol (LDL) levels in the blood. It also decrease good cholesterol (HDL). Therefore trans fat increases the risk of developing heart diseases and stroke. As well

as it is associated with a higher risk of developing type II diabetes. The risk of heart disease with trans fat is higher than that with saturated fats.

How do you reduce your intake of trans fat?

- Use naturally occurring un-hydrogenated oils
- Use processed food only made with un-hydrogenated oils
- Use soft margarines over harder forms, as harder forms contain transfat
- Limit commercially fried foods and baked foods
- Limit deep fried food especially from restaurants
- When you deep fry foods at home, use coconut oil instead of unsaturated oils such as vegetable oil, corn oil or sunflower oil. As coconut oil is a saturated oil, chances of producing trans fat is minimal.
- Don't re-use oils. Repeated frying increases trans fat content especially with unsaturated oils

Salt (sodium chloride)

The body only needs a small amount of sodium (less than 500 mg) to function properly.

It is recommended people to consume a maximum of 1500 mg a day of sodium (around 2/3 teaspoon of salt). This is based on scientific evidence and it is the best approach for cardiovascular health. A teaspoon of salt contains 2300 mg of sodium.

Studies show that when people are given a lower salt diet for a period of time, they begin to prefer lower salt food and the foods they used to enjoy before taste too salty. Therefore high salt is a habit. Try to get rid of high salt mood to a lower salt attitude for your own or family health benefits.

High salt intake is directly associated with significantly increased risk of stroke and total cardiovascular disease. Sodium increases the risk of high blood pressure. Reduction of salt consumption helps to reduce risk of hypertension, heart disease as well as stroke.

The higher the ratio of potassium to sodium in the diet, the chances of developing heart disease are lower. Therefore increasing consumption of vegetables and fruits which contain high levels of potassium is beneficial while reducing the salt intake.

Labeling requirements of salt in foods help consumers make informed decisions and restaurants should adhere to health instructions given by health authorities with regard to inclusion of salt in their menus.

You also need to be aware on hidden salt in many food items especially biscuits, bite packets, pizza, soups and sauce. Be aware of food containing mono sodium glutamate (ajinamotto) which add more salt to your body through foods such as koththu, fried rice and many restaurant foods. So limiting restaurant foods will help to avoid getting excess salt.

Adding salt after cooking, not only helps to consume lesser salt but also preserve iodine included in salt for absorption by your body.

Alcohol

Drinking too much alcohol increases risk of high blood pressure, high triglycerides, liver damage, obesity, certain cancers, cardiomyopathy, stroke and accidents.

Drinking low dose of alcohol and red wine may have some cardiac benefits. People who drink alcohol must do so in moderation. However we do not recommend starting alcohol for non alcohol consumers due to it's addictive qualites and it is not possible to predict individul's bodily response on alcohol.

Being physicaly active

Exercising at least 2 ½ hours a week is enough to raise HDL and decrease LDL and triglyceride levels.

Regular physical activity using large muscle groups such as walking, running or swimming produces cardiovascular adaptations that increases exercise capacity, endurance and skeletal muscle strength.

Habitual physical activity also prevents the development of coronary artery disease and reduces the symptoms in patients with established cardiovascular disease. Physical activity both prevents and helps to treat many atherosclerotic conditions including elevated blood pressure, LDL and triglycerides as well as insulin resistance.

Reduced physical activity is a major risk factor for heart disease. In elderly individuals' risk of heart attack is reduced by 50% by walking 30 minutes daily. Activities with vigorous and moderate intensity are associated with lower risk of disease.

Increased physical activity begins with increase lifestyle activities. A complete exercise programme includes aerobic exercise, resistive training and stretching. Benefits can be derived from minimum of 30 minutes of daily exercise. Studies have also shown that even 15 minutes a day or 90 minutes a week of moderate intensity exercise may be beneficial.

For Overall Cardiovascular Health:

- At least **30 minutes of moderate-intensity** aerobic activity at least **5 days per week for a total of 150 minutes**

  OR

- At least **25 minutes of vigorous** aerobic activity at least **3 days per week for a total of 75 minutes**; or a combination of moderate- and vigorous-intensity aerobic activity

  AND

- **Moderate- to high-intensity muscle-strengthening activity** at least **2 days per week** for additional health benefits.

For Lowering Blood Pressure and Cholesterol

- An average of **40 minutes of moderate- to vigorous-intensity** aerobic activity **3 or 4 times per week**

Managing stress

Stress of all kinds has a negative effect on cardiovascular system. Researchers have also found that people respond differently to similar stress levels. "Low reactors" can sail through high stress situations with no ill effects while others "the high reactors" feel both physical and emotional afflictions. Research indicated that high reactors have higher LDL levels than low reactors.

Many methods can be used to overcome stress. Such as going out for a walk, meeting your friends, doing deep breathing exercises, medication, yoga, laughing at a funny book or movie or any other entertainment as you wish.

To reduce stress

- Eat happy meals – a smart and healthy diet is important to manage stress.
- Laughter really is the best medicine – a good laugh triggers production of endorphins, which also stimulates your lungs and heart, relaxes your blood vessels and increases blood flow.

  Ex. watching funny movies, reading funny stories and meeting your favourite friends.
- Spend time with pets – stress reduction is one of the great benefits of having pets. Research has linked having a pet with significantly lower triglycerides and cholesterol levels.
- Listen to relaxing music
- Get more sleep
- Talk to some one about how you feel
- Learning how to find solution to your problems
- Manage your time and prioritize your tasks enabling to have enough rest.

Secondary prevention of CHD
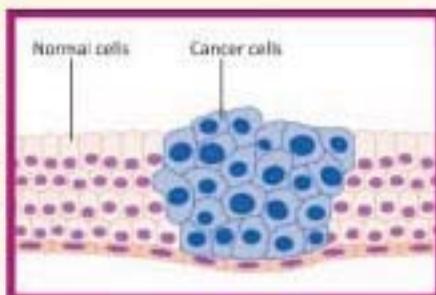
People who already have atherosclerotic disease can also lead a normal life with full life span by early detection of disease and application of interventions to prevent further progression of disease.

CHAPTER 3

Cancer

What is cancer?

An abnormal growth of cells which tend to proliferate in an uncontrolled way. It has the ability to invade close by tissues and spread to distal organs through blood and lymphatic systems.

Normal cells   Cancer cells

How cancer starts?

Cancer is a genetic disease. It is caused by changes to gene that control the way cells function, especially how they grow and devide.

Cancer starts when cells in a part of the body start to grow out of control. Cancer cell growth is different from normal cell growth. Cancer cells grow out of control and become invasive. Cancer cells are less specialized than normal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells can't do. Growing out of control and invading other tissues are what makes a cell to become a cancer cell.

Usually we have just the right number of each type of cell. This is because cells produce signals to control how much and how often the cells divide. If any of these signals are faulty or missing, cells may start to grow and multiply too much and form a lump called a tumour. Where the cancer starts is called the primary tumour.

Some types of cancer, called leukaemia, start from blood cells. They don't form solid tumours. Instead, the cancer cells build up in the blood and sometimes in the bone marrow.

For a cancer to start, certain changes take place within the genes of a cell or a group of cells.

How cancer spreads?

Cancer cells often travel to other parts of the body where they can grow and form new tumors that crowd out normal tissue. This happens when the cancer cells get into the body's bloodstream or lymph vessels. The process of cancer spread is called metastasis.

Cancer is not a death sentence

Certain cancers in Sri Lanka is on the rise. Statistics shows that the number of cancers and death rates from cancers have increased. One third of cancers can be prevented and another one third can be successfully treated if detected early. For the last one third of patients, palliative treatment and care are available to increase patients' life span and quality of life.

Cultural barriers and stigma attached to cancer blocks the pathway for effective treatment and prevention strategies for cancer.

Cancer is not a death sentence, it is a common disease which can be prevented as well as treated.

So health workers as well as general public should target on prevention as well as early detection of cancers. 80% of cancers have four risk factors - unhealthy diet, physical inactivity, alcohol and tobacco. About half of preventable cancers can be prevented by not smoking.

What are the risk factors?

- **Genetic factors:** Genitic factors play a role in causing small percentage of cancers(5% -10%). However majority of cancers are due to environmental and due to aging process. Although the genes of people influence the risk of cancer, most of the difference in cancer risk between people is due to the factors that are not inherited.

- **Diet:**

- **Physical inactivity:**

- **Over weight and obesity**

- **Tobacco:** Tobacco use is a leading cause of cancer and of death from cancer. People who use tobacco products or who are regularly around environmental tobacco smoke (also called secondhand smoke) have an increased risk of cancer because tobacco products and second hand smoke have many chemicals that damage DNA.

- **Age:** advancing age is the most important risk factor for cancer overall, and for many individual cancer types.

- **Alcohol:** Drinking alcohol can increase your risk of cancer of the mouth, throat, esophagus, larynx (voice box), liver, and breast. The more you drink, the higher your risk. The risk of cancer is much higher for those who drink alcohol and also use tobacco.

- **Certain types of infections:**

- **Environmental exposures to different types of chemicals and radiation:**

Genetic factors

It is no surprise that many families have at least a few members who have had cancer. This can be due to the fact that certain family members have some risk factors in common e.g. smoking.

But in some cases, the cancer is caused by an abnormal gene that is being passed along from generation to generation. Only about 5-10% of cancers result directly from abnormal gene inherited. Certain things make it more suspicious to be having genetically acquired, such as many cases of an uncommon or rare type of cancer within the family tree.

following are the circumstances one can suspect having inherited abnormal genes.

- Cancer occurring at younger ages than usual
- More than one type of cancer in a single person
- Cancers occurring in both pair of organs (both kidneys, both breasts)
- More than one childhood cancer in a set of siblings
- Cancer occurring in the sex not usually affected (breast cancer in man)

In some families, many of the women developed breast and or ovarian cancers often at younger age than usual.

Members of these families may undergo genetic counseling to estimate their risk of getting a cancer. As well as they can undergo periodical screening to find cancer early and can even lower her/his risk of getting cancer under professional guidance.

In addition to the genetic risk, obesity, concentrated sugars, refined flour that contribute to impaired glucose metabolism low fibre intake, consumption of red meat and imbalance of omega 3 and omega 6 fats contribute to excess cancer risk.

Infections can increase a person's risk of cancer in different ways.

- Some viruses can affect genes inside the cell that control their growth causing cells to grow out of control

- Some infections can cause long term inflammation in a part of the body which eventually leads to a cancer.

- Some types of infections can suppress a person's immune system which normally helps to protect body from developing cancers.

    e.g. Helicobactor pylori bacteria might increase your risk of stomach cancer.

Human Papiloma Virus (HPV)

Human Papiloma Viruses (HPVs) are a group of more than 200 related viruses. More than 40 HPV viral tpypes can transmit sexually from the skin and mucous membranes of infected people to the skin and mucous membranes of their partners. These viruses can be transmitted by vaginal, anal and oral sex.

Sexually transmitted HPV viruses fall in to two categories.

1. **Low risk types:** these low risk types do not cause cancer but can cause genital warts. Most common low risk types are types 6 & 11.

2. **High risk types:** these types are responsible for causing cancers (mainly cervical cancers). Type 16 & 18 are the most commonly found (>70%) among cervical cancer patients.

Most high risk HPV infections do not cause any symptoms and cleared within 1 – 2 years by immune system without any treatments. Persistent infections with high risk HPV types can lead to cell changes and may progress to cancer.

Vaccine -

HPV vaccines are available to prevent infection by most common high risk HPV types. These vaccines are recommended for females before sexual exposure.

Hepatitis B virus and Hepatitis C virus :

Both infections can cause long term infections which can increase risk of liver cancer. Both infections can spread through blood, unprotected sex or child birth. Vaccine is available for Hepatitis B virus but not for hepatitis C.

Human Immuno Deficiency virus (HIV)

HIV causes AIDS (Acquired Immuno Deficiency Syndrome). HIV infections increases persons risk of getting several types of cancers. HIV can spread through unprotected sex, blood thransfusions, sharing needles or during child birth from infected mother to the child.

HIV infects and destroy white blood cells making the immune system weak which helps viruses to infect and form certain cancers.

Chlamydia trachomatis

It is a very common bacteria spread by sex and affect both men & women. Long term infection can cause cervical cancer for women.

Helicobacter pylori (H. pylori)

Long term infection with H.pylori can cause ulcers in the stomach. Some of these ulcers could lead to cancer. Antibiotics and other medicines can be used to treat H.pylori infections. People with active stomach ulcers should be tested for H. pylori infection.

Diet

There are six groups to form a healthy diet which gives you all the nutrients needed by your body. Eat a variety of food every day in recommended quantities. Each variety adds different nutrients to you. The six food groups are

1. cereals & tubers
2. fruits
3. vegetables
4. fish, pulses, meat & eggs
5. milk & milk products
6. nuts & oily seeds

Cereals : Choose whole grains which contain lots of fibres, vitamins, minerals & phytochemicals as well as antioxidants. All these components are important in prevention of cancers. Choose cereals & yams in correct portion s ize and appropriate calorie values which helps to maintain healthy weight.

> **e.g.** 1 – 2 rice cups per meal (main meal)
> 2 -3 hoppers, 8 – 10 string hoppers, 2 – 3 slices of bread for a person with normal BMI.

Fruits & vegetables : Include plenty of vegetables and green leaves in your diet. Enjoy variety of fruits in correct portions. At least five fruits & vegetables should be consumed daily.

Fruits & vegetables are very good soueces of vitamins, minerals, high fibre, antioxidants and phytochemicals. All these qualities of fruits and vegetables help in disease prevention including cancers.

A statistically significant protective effect was found with regular consumption of fruits & vegetables whereas persons with low fruit & vegetable intake had the twice the risk of cancer compared with high intake.

- eat at least 2 ½ cups of vegetables (9 -15 table spoons) and 1 ½ cups of fruits (2 – 3 medium size fruits) every day
- emphasize whole fruits & vegetables instead of fruit juices.
- choose 100% juices of fruits & vegetables only if desired in limited quantity (200 ml /day).
- Limit using ice cream, creamy sources as well as cordials and drinks with lesser percentage of fruits & vegetables.

Fish : Fish is a very good source of protein, vitamin D and fish oil (omega 3 fatty acid).

vitamin D – Many studies found a protective relation ship between vitamin D status and lower risk of cancer.

Omega 3 - Oily fish such as tuna, salaya,bolla contains high levels of omega 3 fatty acids.

Recent research reaveled that omega 3 fatty acids prevent or slow down growth of cancerous tumours and also boost our immune system.

consume fish regularly for better health.

portion - 30 g a day or 210 g of oily fish per week.

Meat : Research have shown that eating red and processed meat regularly can increse the risk of bowel cancers and possibly stomach and pancreatic cancers.

Red meat include all fresh, minces and frozen beaf, pork and lamb. Processed meat include ham, bacon salami and sausages. White meat such as skinless chicken is unlikely to increase the risk of cancer.

Cooking meat at high temperatures such as grilling and barbacuing can produce cancer causing chemicals.

Reduce the portion size of meats (maximum 750 g per week).

Pulses : Pulses (include beans, lentils & peas), an important constituent of plant food, are rich in many constituents which can prove to be responsible for preventing as well as suppressing cancer. Such as dietary fibre, resistant starch, phytic acid, saponins, polyphenols, phytosterols etc.

Use herbs and spices instead of artificial flavors. **Flavor food with immune-boosting herbs and spices.** Garlic, ginger, and curry powder not only add flavor, but they add a cancer-fighting punch of valuable nutrients.

Limit fast food, fried foods, and packaged foods, which tend to be high in trans fats and saturated fats which may induce certain cancers. This includes foods like pizza, potato chips, cookies, crackers, french fries, doughnuts etc.

Maintaining body weight

Healthy weight is essential not only to reduce the risk of getting cancer but also to avoid many other chronic diseases. Choose food and drink in correct portion size and appropriate calorie values which helps to maintain a healthy weight.

Maintaining the body weight within healthy limits, avoiding smoking and beetle chewing, staying active throughout the life as well as eating a healthy diet in appropriate quantities may greatly reduce a person's life time risk of developing a cancer.

Over weight and obesity increases the risk of several cancers including breast (in woman post menopausal), colon, rectum, endometrium, esophagus, pancreas and kidney. Over weight and obese people tend to produce more estrogen and insulin hormones that can stimulate cancer growth.

Body Mass Index (BMI) should be kept below 25 kg m^{-2}. Reducing portion sizes, especially of foods high in calories, cutting off fat and

added sugar as well as increasing low calorie food such as fruits and vegetables will help above.

- Being active helps to reduce the risk of cancer by controlling body weight.

- Physical activity also helps to improve immune system as well as to control hormone levels in the body.

- It also reduces risk of getting other chronic diseases like heart disease and diabetes.

Overweight and obesity accounted for 14% of all cancer deaths in men and 20% of those in women. Significant positive association s were found between obesity and higher death rates for the following cancers. Esophagus, colon, rectum, liver, gallbladder, pancreas, kidney, stomach (in men), prostate, breast, uterus, cervix and ovary. This clearly shows that obesity is a major risk factor for cancer.

Latest recommendations for Physical activity for adults

At least 150 minutes (30 minutes 5 days per week) of moderate intensity or 75 minutes (25 minutes 3 days per week) of vigorous intensity activity each week.

This may be broken into shorter periods if necessary e.g. 3 brisk walk or cycle rides of 10 minutes each. This should be in addition to the routine daily activities like walking, climbing stairs, gardening and cleaning etc.

For children:- at least 60 minutes of moderate or vigorous intensity activity each day. With vigorous intensity activity occurring at least 3 days a week is recommended.

Moderate activities make you breath hard. Activities include brisk walking, biking, yoga, gardening etc. Vigorous activity makes use larger muscle groups and makes heart beat faster as well as sweat, such

as fast running, cycling, swimming, playing basketball, badminton, football, volleyball etc.

Sedentary behavior such as sitting, lying down or doing screen based entertainment should be limited.

What are phytochemicals?

phytochemicals are naturally occurring plant chemicals which provides plants colour, odour and taste (flavor). Studies show that phytochemicals have the potential for

1. Stimulating the immune system
2. Blocking substances we eat, drink, and breath from becoming carcinogens
3. Preventing DNA damage and help in DNA repair
4. Reduce oxidative damage to cells that can spark cancer
5. Slow the growth rate of cancer cells
6. Trigger destruction of damaged cells
7. Help to regulate hormones

Favour bright colored vegetables and fruits which are often the best sources of phyto-chemicals. Stick to food forms rather than supplements. Because of phytochemicals in supplement form may not be easily absorbed as those from food.

Thousands of phytochemicals have been identified. (see annex 1)

Many locally available small, coloured fruits like lovi, uguressa, dang, madang, nelli, jambu etc which are known as local berries, may have good antioxidents and phytocemicals which can help to reduce cancer risk.

Limit refind sugars

Glycemic index is an indication of the blood sugar response to a standardized amount of carbohydrate in a food. Glycemic load take into account the amount of food eaten. Latest research indicates that there is an association between diet with high glycemic load and cancer.

Studies show that consistent increase risk of gastric, upper esodigestive tract, endometrial, ovarian, colon and colorectal cancers with consumption of food with high glycemic loads.

Refined sugar, foods containing refined sugar and refined flour products should be limited or avoided.

Include foods rich in fibre

whole grains, fruits and vegetables as well as pulses contain lots of fibre. An inverse relation was found between consumption of above foods and rectal cancer.

Limit Red meat

A significant positive relationship between consumption of red meat and colon and colorectal cancer is found. Research also indicates that processed meat as well as red meat associate with colorectal cancers. Therefore limit consumption of red meat and processed meat such as sausages, meatballs, ham, bacon etc.

Include foods rich in omega 3 fatty acids

Excessive consumption of omega 6 fatty acids and a very high omega 6/omega 3 fatty acid ratio promotes pathogenesis of many diseases, cancer, cardiovascular, inflammatory and auto immune diseases, whereas increased levels of omega 3 fatty acid (poly unsaturated fatty acid) and a low omega 6/omega 3 ratio exert suppressive effects.

Limit alcohol intake or never

Alcohol is an identified risk factor for following cancers. Mouth, throat (pharynx), larynx (voice box), esophagus, liver, colon, rectum and breast. Alcohol may increase the risk of cancer of the pancreas.

Alcohol interacts with tobacco use to increase the risk of cancers of the mouth, larynx and esophagus many times more than the effect of either drinking or smoking alone.

Abstinence is the best. If abstinence is not realistic, people who drink alcohol, should limit their intake to no more than two drinks per day for men and one drink per day for women. A drink of alcohol is defined as 240 ml beer, 100 ml wine or / 25 ml spirits (hard liquor).

People get addicted to alcohol with time and it is difficult to limit intake to such limits. Therefore using alcohol exposes you for risk of addiction and the most healthiest option is to never use alcohol/ abstinence.

In terms of cancer risk, the amount of alcohol consumed is important but not the type of alcohol.

Smoking

The best thing to do is never smoke a cigarette or any other form of tobacco. Once addicted, it s difficult to avoid smoking.

Exposure to the smoke while somebody is smoking is called passive smoking or second hand smoking (environmental tobacco smoke)

Tobacco smoke contains more than 7000 chemical compounds. Out of which 250 are known to be harmful. Therefore second hand smoking has the similar risk as smoking. It has been linked to lung cancer as well as several other cancers such as breast, bladder, stomach, rectum, lymphoma, leukemia etc.

Children and youth should be educated on health effects and addictive qualities of alcohol and smoking.

Recommendations for community level

Increase access to affordable, healthy foods in communities, places of work and schools and decrease access to and marketing of food and drinks of low nutritionally value (especially junk food), particularly to youth.

Provide safe, enjoyable and accessible environments for physical activity in schools and work places and recreation in communities.

Common types of cancers in Sri Lanka

Breast cancer

This is the commonest cancer in females all around the world as well as in Sri Lanka. Health care providers should inform all women about the breast screening options for them.

Breast cancer screening helps to detect breast cancers early and early detection helps to deliver early treatment with better survival rates.

Mammogram: A mammogram is an x-ray of the breast. Mammogram is the best tool to detect breast cancers early. It can be used for screening women at age 40 on wards. Annual screening is recommended for women aged 45 – 55 years and women aged 55 or older should be sreened every two years.

All women should be familiar with how their brests normally look and feel and consult a doctor if there are any change. However it is mandatory for all female, to do self examination of breasts as early diagnosis ensures better chances for recovery.

Self examination

With your shoulders straight and keeping your arms on your hips, look at your breasts in the mirror. Look for any change such as

- – Dimpling, puckering or bulging of the skin
- – Inverted nipples or changed position of nipples
- – Redness, soreness, rash or swelling of breast

1. **Raise your arms and look for above changes**

2. Feel your breasts while lying down, standing sitting or bathing, using the palmer surface of the fingers (flat surface of three middle fingers) but do not use the figer tips.

   use your right hand to feel your left breast and left hand to feel right breast, keeping fingers flat and together, cover the entire breast. continue palpate the brest in clockwise direction from outside of the breast towards the nipple. After examing the breast in the circular direction, examing it in the up & down direction and in wedges.

3. Look for any nipple discharges, blood, yellowish, milky, using thumb and first finger to squeeze areola

4. Then examine the arm pit for any lumps/nodes.

Best days for self examination is a few days after menstrual periods. Women who do not menstruate select a convenient day such as first day of each month and follow it regularly.

When a lump is detected in the breast, it should never be ignored. Without waiting, you should consult a doctor or visit the hospital as soon as possible. Mammography, ultra sound scan and cell biopsy through a needle help to diagnose breast cancer.

Circular Pattern

Does breast cancer cause pain?

Breast cancer usually does not cause pain and tends to grow silently within the breast. Though pain is uncommon in breast cancers, some breast cancers can present with pain (inflammatory breast cancer) rarely. Therefore it is important to take medical advice for breast pains.

Prostate cancer in men

Prostate cancer is rare in men younger than 40 , but chance of having prostate cancer rises rapidly after age 50.

Prostate cancer seems to run in families. Having a father or brother with prostate cancer more than doubles a man's risk of getting prostate cancer.

Screening for prostate cancer

Screening should take place at the,

- – Age 50 for men who are at average risk
- – Age 45 for men at high risk
- – Age 40 for men at even higher risk

Men who want to be screened should be tested with the prostate specific antigen (PSA) - a special blood test and the digital rectal exam (DRE)

For people with negative findings, future screening depends on results of PSA levels.

- Men with PSA of less than 2.5 ng/ml only need to be tested every two years.
- Screening should be done yearly for men whose PSA level is 2.5 ng/ml or higher.
- Most men without prostate cancer have PSA levels under 4 ng/ml of blood
- Men with PSA level 4 - 10 have about 1 in 4 chance of prostate cancer whereas if it is more than 10 ng/ml, the chance of prostate cancer is over 50%.

Oral cancer

Oral cancers are cancerous growths arising from anywhere in the oral cavity (lips, tongue, upper and lower gums, inside lining of the cheeks and lips, floor of the mouth/ under the tongue, roof of the mouth / the hard palate and the area behind the wisdom teeth)

Oral cancer has about a 50% mortality rate and patients in advanced stages die within 5 years. Therefore prevention and early detection are important for oral cancer.

Main risk factors are:-
- Chewing of betel quid
- Chewing of smokeless tobacco and areca nut products (Babul Beeda, Mawa, Areca nut packets, snuff dipping)
- Smoking (Cigarette, Cigars, Beedi, Pipes)
- Heavy alcohol use
- Poor diet
- Being infected with certain types of human papilloma virus (HPV)
- Being exposed to Sunlight (lip cancers only)

In recent years, young adult males and school boys have been found addicted to babul beeda, cancer causing agent (small packets of processed areca nuts which are illegally sold).

Symptoms of oral cancer

- Persistent ulcers in the lips or mouth that bleeds easily and do not heal within two weeks.
- Swellings, thickenings, lumps, bumps or rough spots, crusts or eroded areas on the lips, gums or other areas in side mouth.
- Unexplained bleeding in the mouth
- Unexplained numbness, loss of feeling, pain or tenderness in any area of the face, mouth or neck.
- Soreness or feeling of something caught in the back of the throat.
- A change in the way your teeth or dentures fit together

If you have any of these changes, consult your dentist or go to nearest hospital.

Screening for oral cancer –

Screening helps finding pre cancerous lessions or cancers early and decrease chances of dying from these cancers. Screening of oral cancer can be done by a dental surgeon during their routine checkups. They look for lesions or abnormal patches.

Leukoplakia – an abnormal white patch

Erythroplakia – an abnormal red patch

These abnormal lesions on mucous membranes may become cancerous if left untreated.

Oral sub mucous fibrosis is a chronic disease of the oral cavity with a significant risk for malignancy and it is characterized by inflammation and progressive fibrosis of the underline tissues. This condition results in burning sensation in the oral mucosa at the early stages and an eventually leads to the inability of opening the mouth.It is mainly caused by the consumption of areca nut.

Self Examination:

An important factor to control oral cancer is to perform regular oral screening especially those who are having the risk habits for oral cancers. Self-mouth examination can be performed at least once a month by the person himself or herself by observing all the parts of the mouth through a mirror. If he/she finds any abnormality, it is important to perform a clinical mouth examination done by a dental surgeon. Abnormalities also can be detected through the annual clinical mouth examination done by a dental surgeon.

- Patches of red or white in the mouth
- Sores present in weeks
- A lump in the neck
- Unusual thickening of tissues in the mouth

Avoid possible risk factors

- Lower your risk of getting oral cancer
- Don't ignore suspicious growths, abnormal patches in the mouth. If you notice unusual changes, see a doctor or dentist immediately
- Have precancerous lesions treated, especially erythroplakia or leucoplakia.

Cervical cancer

Cervix is the lowerpart of uterus that opens into vagina. Cervical cancer is second commnest cancer among females in Sri Lanka. Cervical cancer is a preventable cancer. There is a definite pre cancerous stage in cervical cancer. This stage can be identified by a pap test. If detected at this stage it is possible to prevent it becoming an inversive cancer.

During early stages of cervical cancer hardly any symptoms. How ever once it become invasive cancer, following symptoms can be seen.

- Bleeding from the vagina especially between menstrual periods
- pain during sex
- post coital bleeding
- abnormal vaginal discharges (discoloured, excessive or fowel smelling.)

Annex
List of phytochemicals

No.	Name of phytochemical	Plant source	Benefits
1	Carotinoides Beta-carotine Lycopene Lutein zeaxanthin	Red, orange & green colour fruits- e.g. broccoli, carrots, cooked tomatoes, green leaves, sweet potato, oranges, water melon	May inhibit cancer growth. Work as antioxidants & improve immune response.
2	Flavonoides e.g. anthocyanins quercetin	Apples, citus fruits, onions, soy beans, soy products, coffee & tea, red, blue, purple fruits (berries & cherries)	May inhibit inflammation & tumor growth. Improve immunity. Boost production of detoxifying enzymes in the body.
3	Indoles & glucosinolates (sulforaphane)	Cruciferous vegetables (broccoli, cabbage, cauliflower, raddish, knoll-khol)	May induce detoxification of carcinogens. Limit production of cancer related hormones. Block carcinogens & prevent tumor growth.
4	Inositol (phytic acid)	Bran from oats, rice, rye, wheat,, nuts, soy beans & soy products	May retard cell growth & work as antioxidents.
5	isothiocyanates	Cruciferous vegetables	May induce detoxification of carcinogens. Block tumor growth & work as antioxidant.
6	isoflavones	Soy beans & soy products	May inhibit tumor growth. Limit production of cancer related hormones and an antioxidant
7	Polyphenols (such as ellagic acid esveratrol)	Green tea, grapes, wine, berries, citrus fruits, apples, whole grains, pea nuts	May prevent cancer formation. Prevent inflammation An antioxidant
8	terpenes	cherries, citrus fruit peel, rosemary	May protect cell becoming cancerous. Slow cancer cell growth. Strength immune function An antioxidant.

References:

- AlEssa H, Bupathiraju S, Malik V, Wedick N, Campos H, Rosner B, Willett W, Hu FB. Carbohydrate quality measured using multiple quality metrics is negatively associated with type 2 diabetes. Circulation. 2015; 1-31:A:20.

- American cancer society

- American Diabetic Association

- American Heart Association

- American Heart Association Recommendations for Physical Activity in Adults

- Block G, Patterson B, Subar A. Fruit, vegetables, and cancer prevention: a review of the epidemiological evidence, Nutr Cancer. 1992;18(1):1-29.

- Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. The New England Journal of Medicine. 2003;348(17):1625–1638.

- Centers for disease control and prevention

- Duester KC. Avocado fruit is a rich source of beta-sitosterol. J Am Diet Assoc. 2001;101:404–405.

- Elwood PC, Pickering JE, Givens DI, Gallacher JE The consumption of milk and dairy foods and the incidence of vascular disease and diabetes: an overview of the evidence.

- Hannah R Vasanthi and R.P Parameswari, Indian Spices for Healthy Heart - An Overview

- He, F.J., et al., Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: meta-analysis of cohort studies. J Hum Hypertens, 2007. 21(9): p. 717-28.

- HUFB Manson JE, Stanfer MJ et al Diet lifestyle and the risk of diabetes mellitus in women

- Jenkins D, Kendall C, Faulkner D, et al. Assessment of the longer-term effects of a dietary portfolio of cholesterol-lowering foods in hypercholesterolemia. Am J Clin Nutr. 2006;83:582-591.

- Lakka TA, Bouchard C, Physical activity, obesity and cardiovascular diseases 2005.

- Luc Djousse, et al.,egg consumption and risk of type 2 diabetes in men and women.

- Luc Djoussé et.al Chocolate consumption is inversely associated with prevalent coronary heart disease: The National Heart, Lung, and Blood Institute Family Heart Study

- Lydia A. Bazzano, MD, PHD1, Tricia Y. Li, MD, MS2, Kamudi J. Joshipura, BDS, MS, SCD3 and Frank B. Hu, MD, PHD Intake of Fruit, Vegetables, and Fruit Juices and Risk of Diabetes in Women

- Pasquale Strazzullo, professor of medicine, Lanfranco D'Elia, clinical lecturer in medicine, Ngianga-Bakwin Kandala, principal research fellow in medical statistics, and Francesco P Cappuccio, professor of cardiovascular medicine and epidemiology

- Patty W Siri-Tarino, Qi Sun, Frank B Hu, and Ronald M Krauss Meta-analysis of prospective cohort studies evaluating the association of saturated fat with cardiovascular disease

- Roberto C., Andreas J. F., Norman K. Hollenberg, Thomas F. Lüscher, Cocoa and Cardiovascular Health

- Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies

- Shan Z et.al Sleep duration and risk of type 2 diabetes: a meta-analysis of prospective studies

- Sheri. R et.al Exercise and Type 2 Diabetes The American College of Sports Medicine and the American Diabetes Association: joint position statement

- Srivastava, K.C., Bordia, A., and Verma, S.K. 1995. Garlic (Allium sativum) for disease prevention. S. Afr. J. Sci. 91: 68-77.

- Vohra K, Dureja H and Garg V, An Insight of Pulses: From Food to Cancer Treatment

- Winham DM, Hutchins AM, Johnston CS. Pinto bean consumption reduces biomarkers for heart disease risk. J Am Coll Nutr. 2007 Jun:26(3):243-9.

- Winham DM, Hutchins AM. Baked bean consumption reduces serum cholesterol in hypercholesterolemic adults. Nutrition Research. Volume 27, Issue 7, pages 380-386 (July 2007).

- World Heart Federation

Author
Dr. Chandanee Withana
Nutrition Specialist
Ministry of Health

Formulation
Mrs. Chalani S. Ilangamge
Nutritionist

Contributors
Dr. L.B.H. Denuwara
Director Nutrition
Ministry of Health

Dr. Uditha Bulugahapitiya
Consultant Endocrinologist
Colombo South Teaching
Hospital

Dr. Damayanthi Pieris
Consultant Oncologist

Dr. Sujeewa Weerasinghe
Consultant Oncologist

Dr. Ruwan Ekanayake
Consultant Cardiologist

Mrs. Chalani S. Ilangamge
Nutritionist

Dr. Sonali Gunathilake
Senior Registrar
Colombo South Teaching
Hospital

National Cancer Control Unit

Dr. Banuja Wijayathilaka
Consultant Community physician
Nutrition Division

Mrs. Sajeewani Mirihagalle
Nutritionist

Dr. Erandi de Silva
Ministry of Health