National Guideline for Management of Dyslipidemia for Primary Health Care Providers

Directorate of Non-Communicable Diseases
Ministry of Health

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National guideline for management of Dyslipidemia for Primary Health Care Providers

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List of Abbreviations

ACR	-	Albumin Creatinine Ratio
AKI	-	Acute Kidney Injury
ALT / SGPT	-	Alanine Aminotransferase
AST / SGOT	-	Aspartate Aminotransferase
ASCVD	-	Atherosclerotic Cardiovascular Disease
BMI	-	Body Mass Index
CABG	-	Coronary Artery Bypass Graft
CKD	-	Chronic Kidney Disease
CPK	-	Creatinine Phosphokinase
CVD	-	Cardiovascular Disease
CV	-	Cardio Vascular
CYP	-	Cytochrome P
DALYs	-	Disability Affected Life Years
DM	-	Diabetes Mellitus
eGFR	-	estimated Glomerular Filtration Rate
FBS	-	Fasting Blood Sugar
FH	-	Familial Hypercholesterolemia
HDL-C	-	High Density Lipoproteins
HbA1C	-	Glycosylated hemoglobin
HLC	-	Healthy Life-Style Centre
LDL-C	-	Low Density Lipoproteins
mg/dl	-	Milligrams per deciliter
mmHg	-	Millimeters of mercury
mmol/l	-	Millimoles per liter
PCSK-9	-	Proprotein Convertase Subtilizing/Kexin type
PHC	-	Primary Health Care
SASE	-	Statin Associated Side Effects
SEAR	-	South East Asia Region
TC	-	Total Cholesterol
TIA	-	Transient Ischemic Attack
TOD	-	Target Organ Damage
TG	-	Triglyceride
TSH	-	Thyroid stimulating hormone
WHO	-	World Health Organization

Introduction

Dyslipidemia is when a person has abnormal levels of lipids in their blood. The most common forms of dyslipidemia include of elevated serum lipid levels of either one or more types (which includes cholesterol, triglycerides and other types of lipids), above a pre-defined maximum concentration and low levels of high-density lipoprotein.
Dyslipidemia can be primary dyslipidemia, which is genetically determined, or secondary Dyslipidemia, which occurs due to reasons such as unhealthy diet, physical inactivity and secondary to other atherogenic conditions such as Diabetes Mellitus and Hypothyroidism.

The most important fact is that dyslipidemia itself does not have any specific symptoms or signs in the early stages of the disease in most patients, and evidence of the disease is identified only during screening involving a laboratory test, hence the importance of screening.

Dyslipidemia is an intermediate risk factor for number of non-communicable diseases, especially for cardiovascular diseases such as ischemic heart disease and stroke and, is a key factor responsible for nearly a third of the global burden of ischemic heart disease. It is estimated that raised blood cholesterol levels cause 2.6 million deaths (4.5% of the total deaths) annually, and 27.9 million disability adjusted life years (DALYs) which is 2% of the total DALYs (World Health Organization, 2019) throughout the world. The World Health Organization had reported that, the global prevalence of raised blood cholesterol levels among adults had been 39% in the year 2008.

It has been estimated that, 34% of the total deaths in Sri Lanka were due to cardiovascular diseases (WHO, 2018) in the year 2016. The STEPS survey conducted in 2015 in Sri Lanka, has revealed that the overall prevalence of raised cholesterol (TC > 190 mg/dl) among adults was 23.7%, with a greater prevalence of 28.4% among females compared to 19.1% in men. (Ministry of Health, 2015). A study conducted in a nationally representative sample in the year 2005 has identified that increasing age, female sex, living in urban sector, high body mass index, central obesity, diabetes, hypertension, insufficient physical activity, and smoking as the factors associated with dyslipidemia among Sri Lankan adults.

Screening for and subsequent optimal management of dyslipidemia will reduce the burden of cardiovascular diseases in the society/community. It has been observed that a 10% reduction in serum cholesterol level in men aged 40 years and men aged 70 years could reduce the incidence of heart disease by 50% and 20% respectively within next 5 years. (WHO, Global Health Observatory data, 2020). Management of dyslipidemia includes mainly measures of lifestyle modification and pharmacological management. This guideline will enable the Medical Officers at primary care to adhere to a standard protocol and streamline the overall management of dyslipidemia.

Objectives of the Guidelines

To identify and manage patients with dyslipidemia in a primary health care setting in a sustainable and cost-effective manner, thereby reducing the burden on the secondary/tertiary health care system in the country.

Intended Recipients

This guideline is intended for the use of Medical Officers at primary health care settings in Sri Lanka.

National NCD Screening programme

The national NCD screening programme, provide a comprehensive package for NCD screening including evaluation of, Blood Pressure, FBS/RBS, Total Cholesterol, Urine dipstick, serum creatinine, CVD risk assessment using WHO/ISH risk charts, waist to height ratio and BMI, in clients who are 35 years or above through the Healthy Lifestyle Centers (HLC) established at the Primary Health Care (PHC) level hospitals. CVD risk assessment using WHO/ISH risk charts are not applied to those who have established cardiovascular disease (Documented ASCVD – stroke/ MI /TIA/ peripheral vascular disease), Blood cholesterol ≥ 309 mg/dL (8 mmol/l), DM with renal disease, CKD (stage 3 and above).

Two categories of people have been identified as eligible by the national NCD screening programme as described below.

Category A: All apparently healthy persons aged 35 years and above. i.e. a person not known to have any of the following diseases and/or not on regular follow up at a medical/specialist clinic:

- Cardiovascular disease [coronary heart disease, cerebrovascular disease, peripheral vascular disease)
- Diabetes, Cancer, Dyslipidemia, Systemic Hypertension, Chronic kidney disease, Chronic liver disease

Category B: Persons aged between 20-34 years having the following risk factors.

- Smoking tobacco during the past one year
- Overweight & obesity (BMI ≥ 25kg/m^2)
- Abdominal Obesity (waist circumference – male > 90cm, female >80cm)
- Persistently Raised BP (≥140/90mmHg)
- Symptoms suggestive of Diabetes Mellitus
- History of premature cardiovascular disease in first degree relatives (male relative < 55 years, female relative <65 years)
- History of Diabetes Mellitus in first degree relatives
- History of Familial Dyslipidemia in first degree relatives

❖ Familial hypercholesterolemia (FH) is the most common form of familial dyslipidemia and it is strongly related to ASCVD at a younger age.
❖ Routine screening for Dyslipidemia is not indicated in pregnant mothers

Investigations

- **Total cholesterol levels**
  - Can be performed on a random capillary blood sample using cholesterol strips.
  - Some centers collect blood samples and send to the closest hospital laboratory.

❖ If total cholesterol level is equal to 240 mg/dl (approx. 6 mmol/l) or more, a lipid profile needs to be carried out

- **Lipid Profile**
  - Require 12-14 hours fasting and a venous blood sample

Management of Dyslipidemia

1. **Non –Pharmacological Management**
2. **Pharmacological management**

1. Non-Pharmacological management of dyslipidemia

- Medical nutrition therapy
- Increased physical activity
- Other lifestyle modifications

*Offer Life style modification interventions to all patients

2. Pharmacological management of dyslipidemia

- Assess history of established atherosclerotic CVD,
- Evaluate the total 10-year CVD risk of the individual using WHO/ISH risk charts (Annexure 2)
- CV risk categorization and relevant clinical conditions in each category (Annexure 3)
- Exclude secondary causes (Hypothyroidism, Renal Disease)
- Decide on drug treatment

Statins is the first line drug for management of dyslipidemia

Indications for statin treatment

1. **Primary prevention**

- Patients not known to have atherosclerotic CVD
- Familial hypercholesterolemia,
- Total cholesterol >300 mg/dl (when LDL is not available and confirmed with a second test)
- Patients with primary LDL-C levels persistently of 190 mg / dl or greater
- Patient's age 40-75 years of age, with an estimated WHO/ISH (SEAR- B) CVD risk ≥ 20%
- All people with diabetes ≥40 years (40-75) of age or age 20–39 years with one or more CVD risk factors.
- In adults aged > 50 years having non diabetic kidney disease with eGFR < 60 ml/min/1.73 m2 or if albuminuria is present (In adults with dialysis-dependent CKD, statin should not be initiated unless patient is already receiving statins at the time of dialysis initiation

2. **Secondary prevention**

- Patients with a history of established atherosclerotic CVD

Indications for referral to a Specialist Physician before at initiation:

- If triglyceride level is > 500mg/dl.
- Patients aged <40 years with total cholesterol

Before starting statin treatment

- Perform clinical assessment
  - Tobacco consumption (Smoking and smokeless)
  - Alcohol consumption
  - Blood pressure
  - BMI and Waist to Height ratio
  - Look for corneal arcus, xanthelesma, tendon xanthomas especially over Achilles tendons
- Perform baseline urine and blood tests
  - FBS
  - Serum creatinine and eGFR
  - UFR /Urine ACR
  - Alanine aminotransferase (ALT): Statins can be prescribed even if liver transaminase levels are raised but are less than 3 times the upper limit of normal.
  - Thyroid-stimulating hormone (TSH) to rule out an important secondary cause[1]

- Look for **contraindications** for statins; e.g. pregnancy, breast feeding

  *Advise women of childbearing age regarding the **potential teratogenicity** and ask the patient **to stop taking at least 3 months ahead** (or switching to another safe lipid lowering drug after specialist opinion) if planning for pregnancy*
  DO NOT restart statins until breastfeeding is over.
- Treat comorbidities and secondary causes of dyslipidemia
- Decide on the drug and the dose according to the LDL goal

Treatment goals

Table 1 : Treatment goals for primary and secondary dyslipidemia

Primary prevention goals	LDL goal	TC goal (extrapolated)
High risk (WHO/ISH risk ≥ 20%)	LDL<70mg/dL (<1.8 mmol/L)	3mmol/l (54mg/dL)
Moderate risk (WHO/ISH risk 10% to <20%)	LDL<100mg/dL(2.6 mmol/L)	4mmol/l (72mg/dL)
Low risk (WHO/ISH risk <10%)	LDL<116mg/dL (3 mmol/L)	5mmol/l (90mg/dL)
Secondary prevention goals		
Established ASCVD	LDL<55mg/dL(<1.4mol/L)	2mmol/l (36mg/dL)
ASCVD with second event within 2years	LDL<40mg/dL(1mol/L)	

- The dose of statin can be decided according to the percentage reduction of LDL, we need to achieve to, reach the desired treatment goal. Refer to Annexure 4 table 5
- The intensity level is divided into: high intensity (40 %), medium intensity (31%-40%) and low intensity (20%-30%) to reach the intended goal

[1] Some of the investigations may not be available at PMCIs, arrangements should be made to send samples to the apex hospital or refer the patient to secondary and tertiary care hospital where the investigations are available.

Treatment regimen

For Primary Prevention (Figure 1)

1. Offer atorvastatin 20 mg/rosuvastatin 10 mg (High intensity statins) to the following people
   - People with an estimated WHO/ISH CV risk ≥ 20%
   - Adults with diabetes mellitus with an estimated WHO/ISH CV risk ≥ 20%
   - People with chronic kidney disease Stage 3 - 5
   - Severe Hypercholesterolemia (LDL-C ≥190 mg/dL [≥4.9 mmol/L])

2. It is reasonable to prescribe atorvastatin 10mg / rosuvastatin 5mg (Moderate intensity statins) to all diabetics
   - aged 40–75 years, without past history of CVD
   - who are younger than 40 years of age and/or have type 1 diabetes with other CVD risk factors

For Secondary prevention (Figure 1)

1. Start atorvastatin 40mg/rosuvastatin 20mg nocte with past history of CVD and without CKD. However, the recommendation is 80mg in Western guidelines.
2. Start atorvastatin 20 mg or rosuvastatin 10mg nocte in patients with past history of CVD and with CKD.

Treatment regimen is given below in **Figure 1**

The doses of statin will be based on the percentage reduction of LDL Cholesterol to achieve the treatment target

Table 2: Statin potency and desired percentage of LDL reduction

Statin potency category	Percentage LDL-C reduction	Type & dose of statin
High intensity	>40%	Atorvastatin 20 – 80 mg/d Rosuvastatin 10 – 40 mg/d
Moderate intensity	31 to 40%	Atorvastatin 10 mg/d Rosuvastatin 5mg/d Simvastatin* 20 – 40 mg/d
Low intensity	20 to 30 %	Simvastatin* 10 mg/d

* Simvastatin not used due to high side effects

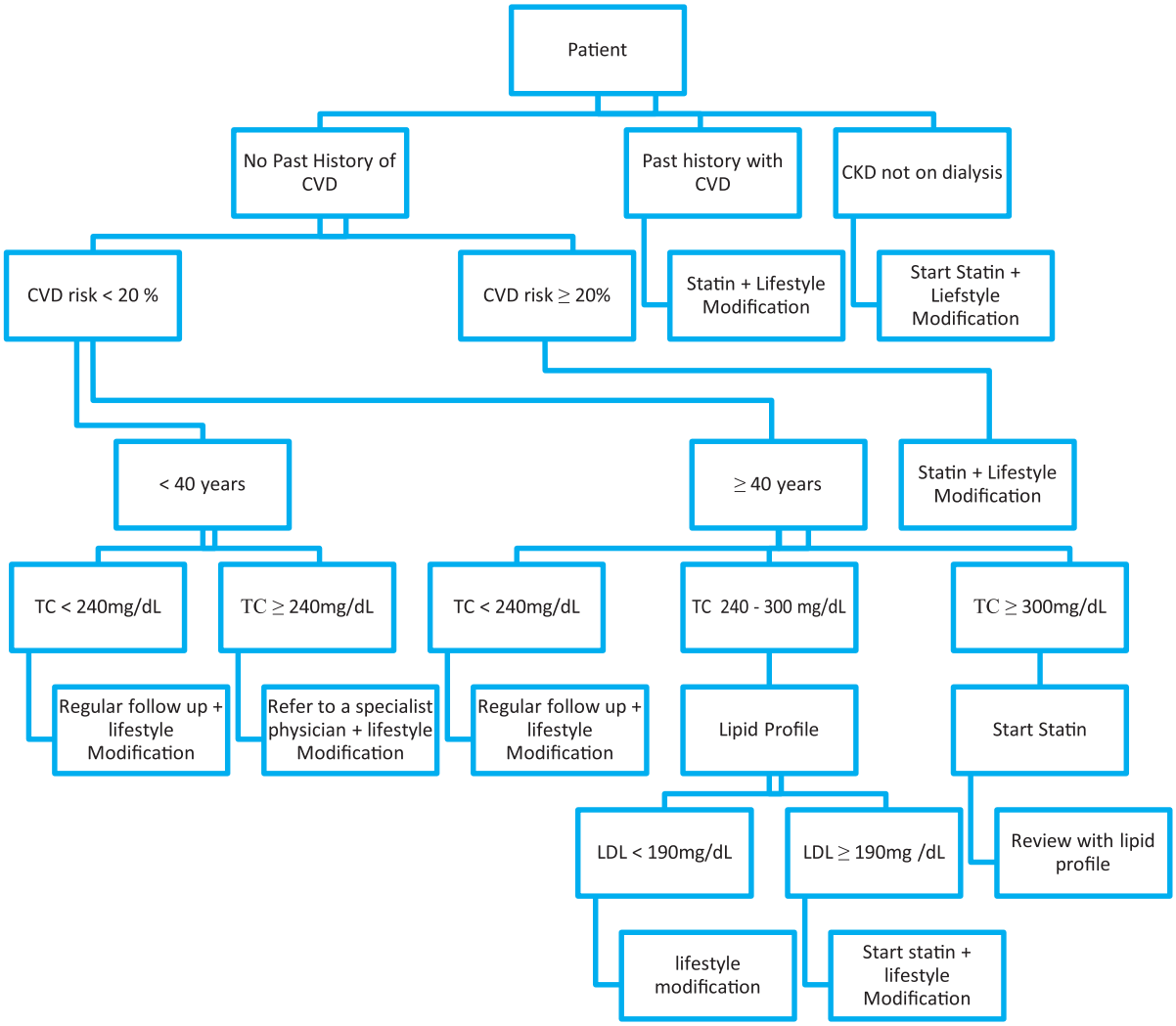


Figure 1: Screening and management of hyperlipidemia patients

Follow-up and monitoring

- Repeat lipid profile and ALT in 3 months after initiation of statins or each dose adjustments.
- Arrange annual assessment for people taking statins long term
  - To discuss medicines adherence, lifestyle modification and other ASCVD risk factors.
  - To assess control with a fasting lipid profile

Note: At diagnosis the treatment goal is set based on LDL and total cholesterol

If desired reduction is not achieved:

- Discuss adherence and timing of dose.
- Optimise adherence to diet and lifestyle measures.

- Adverse reactions to statins are rare, statin associated side effects (SASE)is described in detail in annexure 4
- Do not routinely measure creatinine kinase (CPK) levels or ALT in asymptomatic patients on statins.
- Do not stop statins if an increase in blood glucose level or HbA1c is noted while on treatment.
- Monitor FBS only in pre-diabetics, elderly, obese, and patients on high dose statin annually
- Ask for muscle pain, tenderness or weakness while taking a statin. If they report so, do serum CPK level. Statins will be discontinued if CPK is raised more than 10 times the upper limit of normal in symptomatic patients.
- Explore other possible causes for muscle pain or weakness and raised CPK particularly if they have previously tolerated statin therapy for more than 3 months.
- Repeat serum ALT levels, 2-3 months after starting treatment or if dose is increased. Discontinue statins if ALT increase more than 3 times the upper limit of normal patients.

Indications for referral to a Specialist Physician during follow up

- If target LDL level not achieved with maximum dose of a statin (atorvastatin 40mg) despite adherence to the drug and life style modification after 3 months
- If patient develops statin Associated Side Effects (SASE).

Non-Pharmacological Management:

Medical Nutrition Therapy

For patients who are eligible for screening for dyslipidemia and who do not meet the criteria for a referral to a specialist should be prescribed with the "Heart Healthy diet".

Heart Healthy Diet

Goal: To Reduce total and LDL cholesterol and to increase HDL cholesterol

For a sedentary individual with a normal body mass index (BMI 18.5 – 24.9 kgm^2) can be given the dietary recommendations to meet the requirements of heart healthy diet. (Patients with BMI <18.5 or >25 kgm^2 should be referred to Medical Officer/ Medical Nutrition Unit for individualized counseling and follow up) Annexure 5

General advises

- Eat a variety of nutritious foods from all the food groups, in appropriate amounts as given above to maintain optimal body weight and to get all the nutrients. Annex 5
- Encourage to choose fiber rich whole grains / less polished grains for most of the grain servings.
- Main aim is to change the fat composition by increasing healthy fats in the diet. Therefore;
- Restrict foods containing saturated fat such as red-meat, meat with visible fat cheese and full-fat dairy.
- Include foods containing unsaturated fats such as fish (Sardines, Salaya, Hurulla, Kumbalawa, Salmon, Mackerel and Tuna), nuts, seeds, avocado and olive oil.
- Include egg white without restrictions, egg yolk 3-4/week and plant sources of proteins etc
- Add fresh vegetables, green leaves amply and fruits
- Use healthy cooking methods.
- Prepare more fresh salads with vegetables to minimize the loss of nutrients

- Reduce the amount of coconut milk used for cooking
- Preferred methods of cooking such as steaming, 'mirisata', 'ambulata' etc.
- Restrict deep frying where oil is heated to very high temperatures. If frying is needed, can use other options such as use of air frying or using coconut oil.
- Avoid re-use of cooking oil.
- Avoid junk and processed food

Therapeutic Lifestyle Change Diet

- For a person who fulfills the criteria for referral to a specialist or if Heart healthy diet fails to improve hyperlipidemia, the "Therapeutic Life style Change Diet" (Cholesterol/ Saturated fat restricted step II diet) will be prescribed.
- For this prescription patient should be referred to a Medical Nutrition Unit.

Physical activity

- Regular physical activity has shown to lead to favorable changes in plasma lipids including an increase in HDL and a decrease in TG levels.
- Try to reduce the sitting-time and engage in physical activity throughout the day.
- Advise adults to engage in at least 150 minutes of moderate-intensity aerobic physical activity or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate and vigorous intensity physical activity. (Annexure 6).

Other lifestyle Modifications

- Maintain optimum body weight (target BMI18.5 to 23 kg/m2)
- Avoid alcohol consumption
- Quite smoking and other forms of tobacco
- Minimize stress by involving yourself in stress relieving activities e.g.meditation, yoga, listening to music, leisure activities
- Sleep at least for 6hrs per day

Annexure I

History and Examination

- For risk factor identification, the following history and examinations can be used as a guide. The majority are asymptomatic but could have symptoms of other non-communicable diseases.
- Specific symptoms to elicit in the history are,
- Disease symptoms –
- Ischemic type of chest pain (i.e angina on walking)
- Transient Ischemic Attacks
- Features of peripheral arterial disease, (i.e.claudication type leg pain on walking)

Past medical history

- Diabetes mellitus
- Impaired Glucose Tolerance
- Past obstetrics history: Gestational Diabetes Mellitus, Pregnancy Induced Hypertension
- Systemic Hypertension,
- Coronary artery disease/Coronary interventions(stenting/CABG)
- Transient ischemic attacks / strokes
- Obesity,
- Kidney disease
- Nephrotic syndrome
- Polycystic Ovarian Syndrome
- Hypothyroidism
- Hypopituitarism
- Chronic inflammatory disease such as Rheumatoid arthritis

Family History

- Ischemic Heart Disease
- Cerebrovascular disease
- Hyperlipidemia
- Systemic Hypertension
- Diabetes Mellitus
- Chronic Kidney Disease

Drug History

- Corticosteroids
- Estrogens
- Retinoids
- Thiazide diuretics
- Protease inhibitors for anti-retroviral therapy
- Oral contraceptives

Life style

- Exercise history
- Sedentary lifestyle including type of employment
- Tobacco use
- Alcohol use
- Stressful life (i.e. at home, workplace, financial etc)

Diet

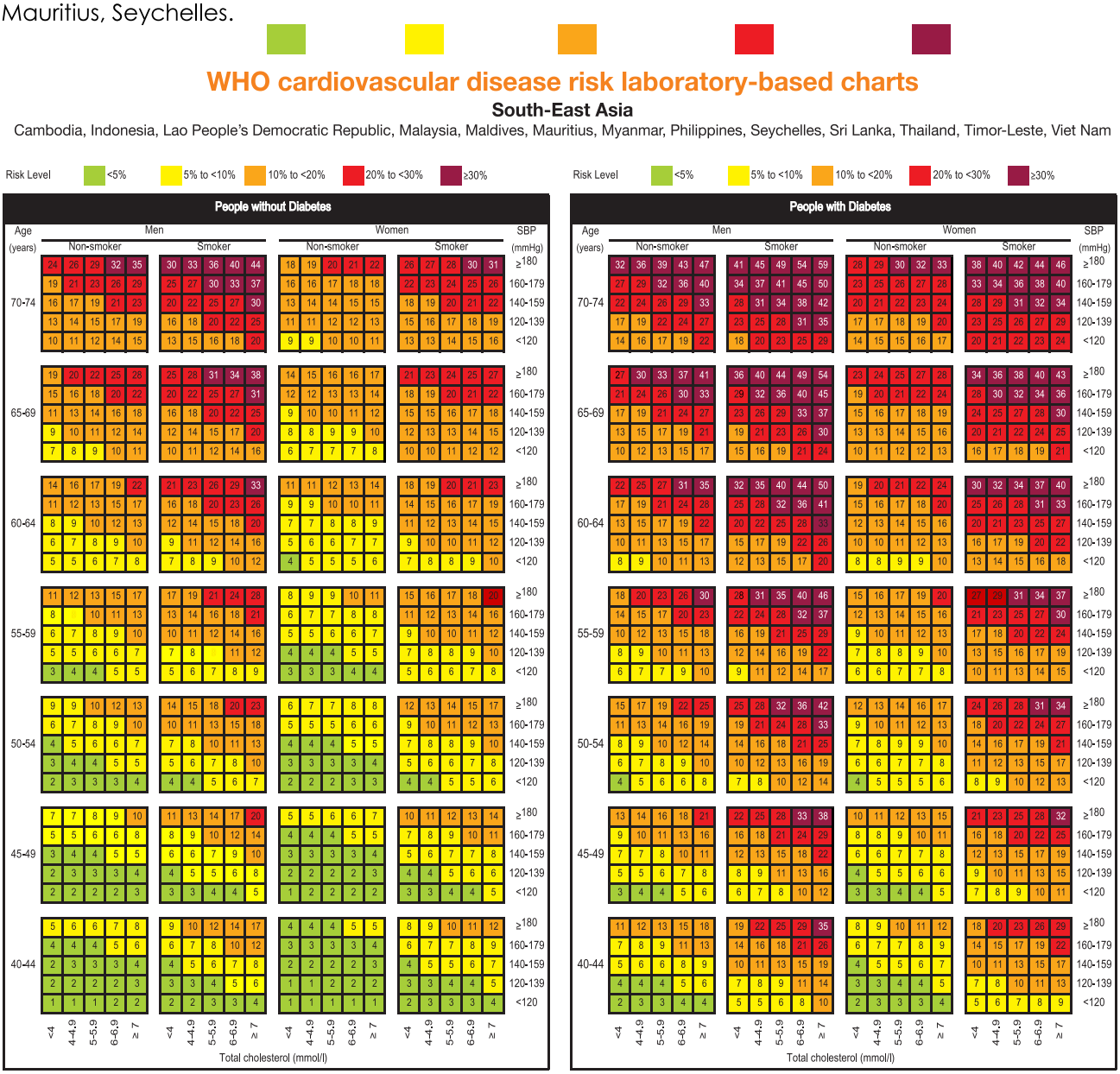
- High saturated fats and High cholesterol
- Frequent eating from outside the home
- Intake of deep-fried food
- Intake of processed food
- Type and amount of oil used

Specific signs to elicit in examination:

- Xanthelasma / xanthomata (In all cases especially if lipids levels are very high in the young, with a positive family history of dyslipidemia or premature ASCVD)
- Look for corneal arcus, xanthelesma and xanthomata especially over extensor surfaces of hands, elbow and over the Achilles tendon.)
- Weight and Height (calculate BMI, if 25 kg/m^2 or above indicates overweight and obesity)
- Measure Waist circumference (If ≥ 90 cm for males and ≥ 80 cm for females indicates central obesity)
- Calculate Waist to height ratio (If ≥ 0.5 indicates central obesity)
- Upper arm blood pressure (If persistently ≥ 140 / 90mmHg indicate systemic hypertension)
- Goiter / signs of Hypothyroidism

Annexure 2

WHO cardiovascular disease risk laboratory-based charts for Southeast Asia Indonesia, Cambodia, Lao PDR, Sri Lanka, Maldives, Myanmar, Malaysia, Philippines, Thailand, Timor-Leste, Viet Nam, Mauritius, Seychelles.

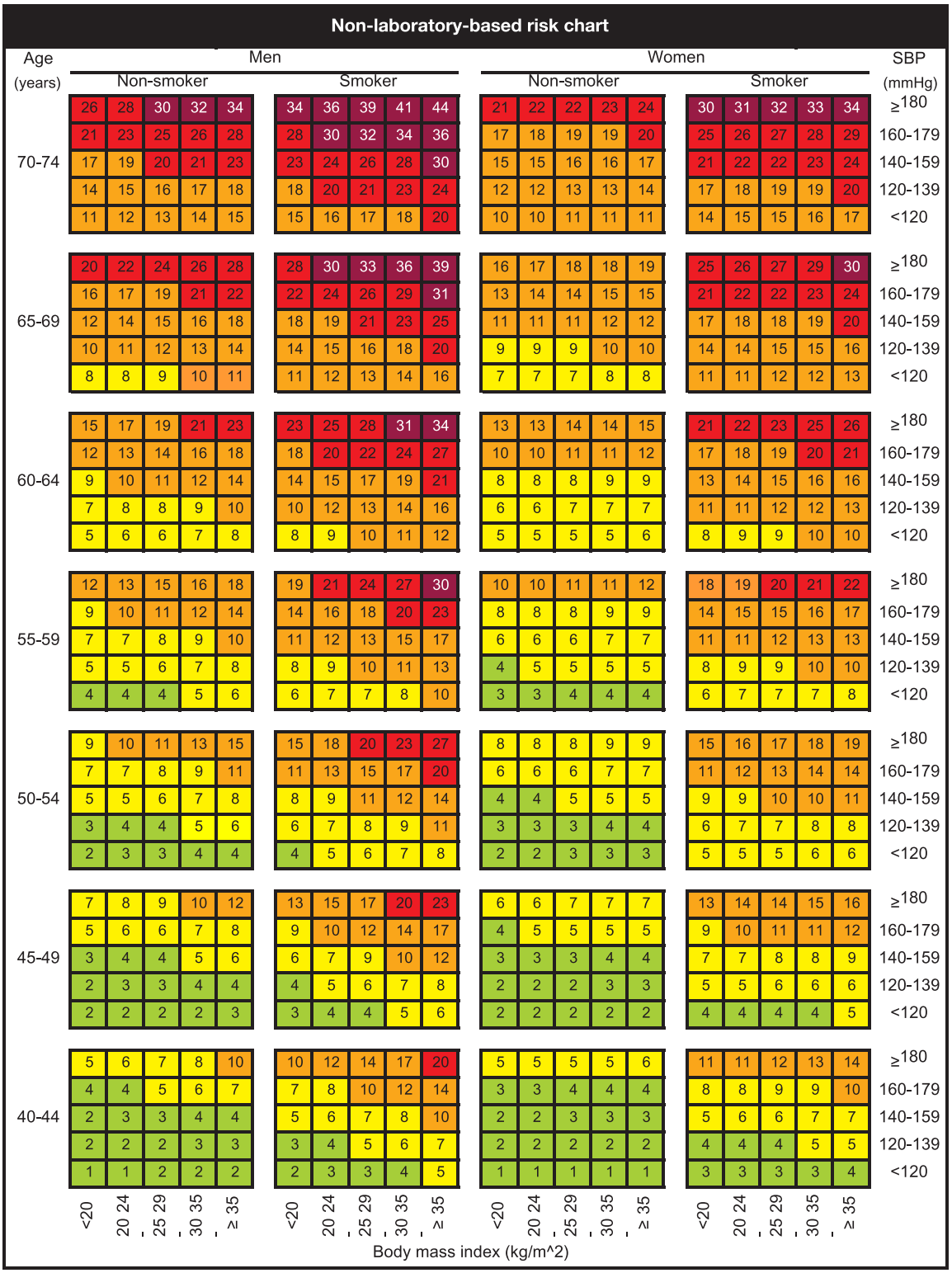


WHO cardiovascular disease risk non-laboratory-based charts for Southeast Asia Indonesia, Cambodia, Lao PDR, Sri Lanka, Maldives, Myanmar, Malaysia, Philippines, Thailand, Timor-Leste, Viet Nam, Mauritius, Seychelles. Risk Level 0

WHO cardiovascular disease risk non-laboratory-based charts

South-East Asia

Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Maldives, Mauritius, Myanmar, Philippines, Seychelles, Sri Lanka, Thailand, Timor-Leste, Viet Nam



South-East Asia

WHO/ISH risk chart

- **Estimate the 10 year cardiovascular risk as follows using laboratory based charts;**

  Step 1 - Select the appropriate chart depending on the presence or absence of diabetes

  Step 2 - Select male or female tables

  Step 3 - Select smoker or non-smoker boxes

  Step 4 - Select age group box (if age is 54; select 50 - 54, if age 55; select 55 - 59)

  Step 5 - Within this box find the nearest cell where the individual's systolic blood pressure (mmHg) and the total blood cholesterol level (mmol/l) cross. The colour and the number of this cell determines the 10 year cardiovascular risk.

- **Estimate the 10 year cardiovascular risk as follows using non laboratory based charts;**

  Step 1 - Select male of female tables

  Step 2 - Select smoker or non-smoker boxes

  Step 3 - Select age group box

  Step 4 - Within this box find the nearest cell where the individual's systolic blood pressure (mmHg) and the Body Mass index (kg/m2) value cross. The colour and the number of this cell determines the 10 year cardiovascular risk.

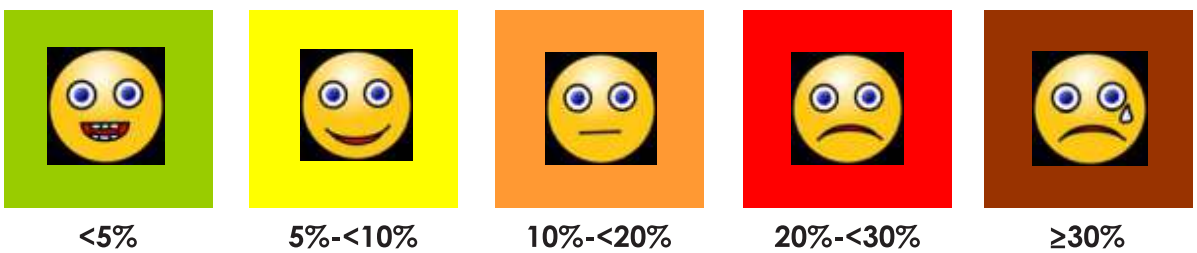


Figure 2: WHO/ISH risk chart

Annexure 3

CV risk categorization and relevant clinical conditions in each category

Risk category	Clinical Condition
Very high	Established CVD DM with TOD (nephropathy, neuropathy, retinopathy), Or 3 other major CV risk factors, Or long duration >20 y Severe CKD e GFR <30 Familial Hypercholesterolemia with ASCVD Or one major CV risk factor WHO risk >30%
High	DM without TOD, Or with another major CV risk factor, Or 10 -20 y duration LDL-C >190 mg/dl Or total cholesterol >310 mg/dl Hypertension > 180/110 mmHg Familial Hypercholesterolemia without other CV risk factors Moderate CKD e GFR 30-60 WHO risk 20-30%
Moderate	DM < 10 y without major CV risk factors WHO risk 10- <20%
Low	WHO risk <10%

Annexure 4

Statins

Grouping of statins on Intensity of lipid lowering potency

	% Reduction in Low-Density Lipoprotein Cholesterol (LDL-C)				
Dose (mg/day)	5	10	20	40	80
Simvastatin	–	27% A	32% B	37% B	42% CD
Atorvastatin	–	37% B	43% C	49% C	55% C
Rosuvastatin	38% B	43% C	48% C	53% C	–

A – 20%-30% reduction (low intensity**); B – 31%-40% reduction** (medium intensity); **C – reduction of more than 40%** (high intensity); **D – increased risk of myopathy**

Adverse effects of statin therapy

Adverse effects on muscle

Myopathy is the most clinically relevant adverse effect of statins. Risk of myopathy is more due to interaction with concomitant drugs (Appendix 8). Rhabdomyolysis is the most severe form of statin-induced muscle damage, characterized by severe muscular pain, muscle necrosis, and myoglobinuria potentially leading to AKI (acute kidney injury) and death. In rhabdomyolysis CPK levels are elevated by ≥ 10 times, the upper limit of normal[52-54].

Adverse effec ts on the liver

The common definition of clinically relevant ALT elevation is an increase of three times the upper limit of normal on two consecutive occasions. Mild elevation of ALT can occur in 0.5-2.0% of patients but has not been shown to be associated with true hepatotoxicity or changes in liver function. Progression to liver failure is exceedingly rare, therefore routine monitoring of ALT during statin treatment is no longer recommended[2,55-58].

Increased risk of new-onset diabetes mellitus

This is a consistent, dose-related effect. The number needed to cause one case of diabetes has been estimated as 255 over 4 years of statin treatment. The risk is higher with the more potent statins at high doses, and is also higher in the elderly, and in the presence of other risk factors for diabetes such as overweight or insulin resistance. However, absolute reduction in the risk of CVD in high-risk patient clearly outweighs the possible adverse effects[1,59-62].

Increased risk of haemorrhagic stroke

Total cholesterol is negatively associated with haemorrhagic stroke in observational studies, but this need to be further studied due to conflicting findings in different studies[63-65].

Adverse effects on kidney function [50]

There is no clear evidence that statins have a clinically significant beneficial or adverse effect on renal function. An increased frequency of proteinuria has been reported for all statins, but in most cases, is not higher than for placebo[49].This has been analysed in more detail for rosuvastatin and with a dose of 80 mg, a frequency of 12% was reported but with the approved doses of <40 mg, the frequency is much lower and in line with the frequency for other statins. The proteinuria induced by statins is of tubular origin, usually transitory, and is believed to be due to reduced tubular reabsorption and not due to glomerular dysfunction [66]

Drug interactions

Occurs due to CYP system involvement in metabolism. All currently available statins except, rosuvastatin, and pitavastatin undergo major hepatic metabolism via the CYPs. Combination of statins with gemfibrozil enhances the risk of myopathy therefore that combination is contraindicated but there is very little increased risk for myopathy when combining statins with other fibrates, such as fenofibrate, bezafibrate, or cipro fibrate[67,68]. List of common drug interactions are given in Table 6

Drugs potentially interacting with statins metabolized by cytochrome P450 leading to drug interactions[65]

Anti-infective agents	Calcium antagonists	Other
Itraconazole	Verapamil	Ciclosporin
Ketoconazole	Diltiazem	Danazol
Posaconazole	Amlodipine	Amiodarone
Erythromycin		Ranolazine
Clarithromycin		Grapefruit juice
Telithromycin		Nefazodone
HIV protease inhibitors		Gemfibrozil

Annexure 5

Daily recommendation for heart healthy diet for a person with sedentary lifestyle

Food group	Number of servings per day	1 serving size	1 serving size equal to:
Cereal / Yam/ Starchy food	6	½ cup	½ cup rice ½ cup of cooked noodles 1 slice of bread (50g) 2 - 3 string hoppers 1 hopper ½ rotti (about 10cm diameter and 0.5cm thick) 1 dosai (about 10cm in diameter) 3 cm height pittu ½ cup of boiled sweet potato / Manioc / Raja ala /other yam ½ cup jack/ bread fruit ¾ cup of boiled corn
Pulses	3	1/2 cup / 3 tbs	3 tbs dhal 3 tbs kadala parippu 3 tbs mung parippu ½ cup chickpeas ½ cup cowpea ½ cup green gram 2 tbs soya meat
Fish / Poultry /meat / Egg	2	30 g (Size of Two match boxes)	2 match box size fish 2 match box size chicken 1 match box size dry fish 10 - 20 sprats 1 egg
Milk	1	1/2 cup	1/2 cup non-fat fresh milk Full 1 tbs nonfat milk powder
Nuts and seeds	1	1 full tbs	1 full tbs Peanut 5 full Cashew 1 full tbs pumpkin / sun flower seeds 1 Thala guli 10 Kottang
Root vegetables	1	3 tbs	3 tbs Ash plantain / Pumpkin/ Bread fruit/ Jack fruit/ Potato/ sweet potato/ manioc/ other yams/ Carrot/ Beet/ Radish/ Nokol/ Kohila/ Lotus roots
Green Vegetables	1 ½	3 tbs	3 tbs Beans/ Murunga/ Wetakolu/ Pathola/ Dambala/ Bitter gourd (Karavila)/ Thibbatu / Elabatu/ Lunu mal/
Leafy vegetables	3	3 tbs	3 tbs Gotukola/ Kathurumurunga/ Mukunuwenna/ Spinach/ Kungkun/ Anguna/ Thembu/ Sarana/ Thampala/ Murunga leaves/ Pumpkin leaves/ Carrot leaves/ beet leaves/ Radish leaves/ Nokol leaves/ Cabbage leaves/ Passion leaves/ Manioc leaves/ Tender kohila leaves/ Onion leaves

Other vegetables	1	3 tbs	3 tbs Brinjal/ Cucumber/ Capsicum/ Tomato/ Keselmuwa/ Cauliflower/ Ambaralla/ Green mangos
Fruits	2	1small (100g) or ½ cup of fresh cut fruit or canned fruit ½ cup unsweetened fruit juice 1 ½ tbs of dried fruit	1 cup cubed papaya 1 small banana ½ large guava 1 medium pomegranate 1 medium mango ½ small jambola (grapefruit) ½ cup fresh pineapple 5 large / 10 small grapes 1 cup cubed water melon 5-6 jack fruit 1 medium wood apple 1 small belli fruit 2 medium amberalla 10 – 15 jambu 7-9 rambuttan ½ cup anoda 2 pieces of durian 2 medium passion fruits 10 fruits of nelli / lovi / veralu 2 small mandarin 1 small orange (6 cm across) 1 small apple (5 cm across) 5 strawberries ½ cup mulbbery ½ medium avocado
Coconut	½	2 tbs Grated coconut or ½ cup Coconut milk	½ cup of coconut milk 2 tbs coconut 3 tbs gravy
Oil*	1	1 tbs (15 ml)	1 tbs Coconut oil/ Olive oil/ sesame oil/ Soya oil/ Sun flower oil/ Rice bran oil
Sugar	3	1 tsp	1 tsp Honey 1 tsp Treacle Thumb size piece of Jaggery
Salt	1	1 level tsp	
Water	6 – 8	1 cup	
Other Beverages	2 -3	1 cup	1 cup Light plain tea/ Coffee/ Herbal drinks (Belimal, Ranawara) /Coriander water/ king coconut / Coconut water

1 cup – 200 ml cup, tbs = table spoon, tsp = tea spoon

All given food are edible portions, otherwise specified

*When choosing oil, take only 5 ml from coconut oil and use 10 ml from other oil to improve the fat composition

Annexure 6

Physical activity recommendation

Type	Description	Examples
Moderate intensity physical activity	Aerobic physical activity sessions of at least 150 minutes, throughout the week (i.e 3-5 days per week) (If the goal of 30 minutes of physical activity cannot be met in a single session, multiple sessions lasting 10 minutes each, during the course of a day may also be encouraged)	Brisk walking, cycling, gardening and less strenuous sports activities
Vigorous intensity physical activity	Vigorous physical activity 75 minutes throughout the week (i.e. 3 to 5 days per week)	Running, fast swimming, fast cycling and strenuous sports activities
Muscle strengthening	Can be done after aerobic goal is achieved. Should be done involving major muscles groups on 2 or 3 non-consecutive days; in 8-12 repetitions; 2-4 sets in each repetition with 2 minutes rest between each repetitions	Squats, push-ups, pull-ups, Weights lifting
Flexibility	For full range of movement of joints and muscles. On daily basis, with 4 or more repetitions per muscle group, stretch to the point of slight discomfort.	Forward bend, toe touch, yoga

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