

# **Guideline on Management of Overweight and Obesity Among Adults in Sri Lanka**



Non Communicable Disease Unit  
Ministry of Health, Nutrition and Indigenous Medicine.



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<b>Contents</b>	<b>Page No</b>
List of abbreviations	4
Introduction	5
Epidemiology	5
Classification	6
Assessment	7
Management	10
Diet	12
Physical activity	14
Pharmacological therapy	17
Surgery	23
References	23
Annexure	26

## **LIST OF ABBREVIATIONS**

BMI	Body Mass Index
ODST	Overnight Dexamethasone Suppression Test
OCP	Oral Contraceptive Pill
PCOS	Polycystic Ovarian Disease
TSH	Thyroid Stimulating Hormone
WHO	World Health Organization

## INTRODUCTION

Obesity is defined as accumulation of excess fat in the body, which is associated with adverse health outcomes <sup>1</sup>. Obesity has become a global problem affecting all societies and age groups. There is an increased prevalence of obesity among adults, adolescents and children in developed as well as developing countries. Increased prevalence of obesity gives rise to increase in obesity associated morbid factors such as hypertension, diabetes, dyslipidemia, obstructive sleep apnoea, degenerative arthritis and cancers. These associated co-morbid factors invariably increase the health care expenditure on subjects with obesity.

## EPIDEMIOLOGY

- The World Health Organization (WHO) estimates, that 39% of adults over 18 years are overweight and 13% are obese in year 2016 <sup>2</sup>. The rates of obesity have tripled in the last 10 years in developing countries. These increased rates were observed especially in the Middle East, Pacific islands, China and south East Asia. The epidemic of obesity has spread rapidly through the South Asian region <sup>3</sup>.
- Local data shows that the prevalence of overweight and obesity in Sri Lankan adults is also increasing. According to the 2015 STEPS survey carried out in Sri Lanka, it was reported that the prevalence of overweight and obesity between 18 to 69 years age group were 23.4% and 5.9% respectively <sup>4</sup>.
- According to the WHO sources, 10% of children are obese in the world. The overall prevalence of overweight among children in Sri Lanka was found to be 2.2% <sup>5</sup>. The same survey found that the overweight among urban school children was 3-5% and among rural children was 1.7%. The prevalence of overweight/obesity among 8 to 12 years old school children in Colombo metropolitan area is 14-15% <sup>6</sup>.
- In analysis of recent data, according to Nutrition month survey 2017, prevalence of overweight among grade 10 male school children was 6.3% and female students was 7.4%<sup>7</sup> while 2016 school health return from Family health bureau showed, prevalence of overweight among grade 1,4,7 and 10 were 2.4%,4.1%,5.8% and 5.2% respectively<sup>8</sup>.

In Asians the distribution of body fat is as important as the BMI. It has been shown that abdominal obesity is higher among Asians than Caucasians for a given body mass index <sup>9</sup>. Therefore, Asians develop obesity related complications at a lower BMI <sup>10</sup>. Additionally, Sri Lankan adults have been found to develop obesity related cardiovascular disease at a lower BMI and waist circumference <sup>11</sup>.

## CLASSIFICATION

Obesity is classified based on the BMI. The BMI is correlated with body fat mass. However, BMI may overestimate the degree of obesity in individuals who are muscular as much as it will underestimate in individuals with a low lean mass with relatively high fat mass. The BMI is calculated using a standard formula. (Annexure 1)

**Table 1 - Classification of Obesity According to the BMI**

Weight Categories	BMI Values(Sri Lanka*)
Underweight	< 18.5
Normal	18.5 – 24.9
Overweight	25 – 29.9
Obesity – class 1	30– 34.9
Obesity – class 2	35 – 39.9
Obesity – class 3	≥40

\*Adopted from available Asian data and modified by the Sri Lankan guideline committee.

- **BMI 23-24.9Kg/m<sup>2</sup> is considered as an increased risk for overweight. (Therefore it is considered as a trigger point for life style modification.)**

The Waist Circumference is a clinical indicator of abdominal obesity, which increases the risk of coronary heart disease, diabetes, hypertension and dyslipidemia 10. If the facilities are available measure the Waist Circumstance at Primary Health Care Units. The WHO technique for measurement of Waist Circumstance is given in Annexure 2.

**Table 2 -Abdominal Adiposity According to the Waist Circumference**

	MALE	FEMALE
Sri Lankan	≥90 cm	≥80 cm



## Assessment

- Assessment of an obese individual is done with the intention to find the factors causing obesity and secondly to evaluate associated complications and comorbidities.
- Obesity is a complex metabolic disease resulting from interactions of a wide variety of hereditary and environmental factors.
- However, excess energy intake and/or reduced energy expenditure due to physical inactivity over a long period of time are the major determinants of obesity.
- In humans, genetic background explains only an estimated 40% of the variance in body mass. The rest is due to adverse life style related factors and epigenetic changes of DNA associated with fetal metabolic programming<sup>12</sup>.

**Table 3 - Causes and associations of obesity<sup>13</sup>**

Environmental Causes	Genetic Causes	Secondary Causes
Excess calorie intake	Monogenic (rare) <ul style="list-style-type: none"> <li>• Leptin deficiency or resistance</li> <li>• Melanocortin 4 receptor mutation</li> </ul>	Cushing's syndrome Hypothyroidism Hypothalamic lesions Polycystic Ovarian Syndrome Medications: e.g. Steroids ,antipsychotics, OCP
Physical inactivity	Chromosomal re-arrangements <ul style="list-style-type: none"> <li>• Prada-Willi syndrome</li> <li>• Lawrence-Moon-Biedl Syndrome</li> </ul>	
	Polygenic (common) A larger number of human genes show variations in DNA sequences that might contribute to obesity	

- Obesity causes many serious medical complications that impair quality of life and lead to increased morbidity and premature death<sup>14</sup>. Thus the complete diagnosis of obesity does not simply depend upon the BMI level but also on the impact of weight gain on health.
- Individuals who fulfill the anthropometric criteria of obesity require evaluation for the presence and severity of specific obesity-related complications to complete the diagnostic process.

**Table 4 - Co-morbidities and complications related to obesity**

System	Condition
<b>Endocrine and Metabolic Diseases</b>	Metabolic Syndrome
	Dyslipidemia – hypertriglyceridemia, reduced HDL
<b>Cardiovascular Diseases</b>	Hypertension
	Coronary Heart Disease
	Cerebrovascular and thromboembolic disease
<b>Pulmonary Disease</b>	Restrictive lung disease
	Obesity hypoventilation syndrome
	Obstructive sleep apnea
<b>Gastrointestinal Disease</b>	Gastro-esophageal reflux disease
	Gallstones
	Pancreatitis
	Liver disease
<b>Neurological Disease</b>	Stroke
	Idiopathic intracranial hypertension
<b>Genitourinary Disease in Women</b>	Polycystic ovarian disease
	Complications during pregnancy
	Urinary incontinence
<b>Musculoskeletal disease</b>	Gout
	Osteoarthritis
<b>Cancers</b>	Esophagus, Breast, Colon, Rectum, Liver, Gallbladder, Pancreas, Kidney, Multiple Myeloma Non-Hodgkin's lymphoma.

## HISTORY

- A weight history from birth onwards
- Current eating habits eg: Food diary
- Triggers of eating
- Physical activity
- Psychological aspect of eating behavior
- Assessment of patient's motivation, readiness for change and expectation
- Presence of obesity related complications such as cardiovascular disease, diabetes, hypertension, psychological issues, obstructive sleep apnoea
- Assess co existent cardiovascular risk factors such as smoking, family history of diabetes
- Drug history (eg: Anti-depressants, Anti-psychotics, Anti-epileptics, Steroids)
- Family history of obesity (may suggest Genetic Syndromes)
- The weights of partner and children will give a clue on shared dietary habits and lifestyle
- Previous treatment and management strategies and their success

## PHYSICAL EXAMINATION

Correct anthropometric measurements of weight (Annex1), height (Annex 2) and waist circumference (Annex-3)

- Features of insulin resistance (Acanthosis nigricans, Skin tags)
- Features of any underlying disease and associated conditions  
E.g. Bradycardia in hypothyroidism, purple striae in Cushing syndrome, hirsutism in polycystic ovarian disease, in children features of Genetic Syndromes
- Presence of complications  
E.g. Elevated Blood Pressure, Eruptive xanthoma in hypertriglyceridemia, osteoarthritis

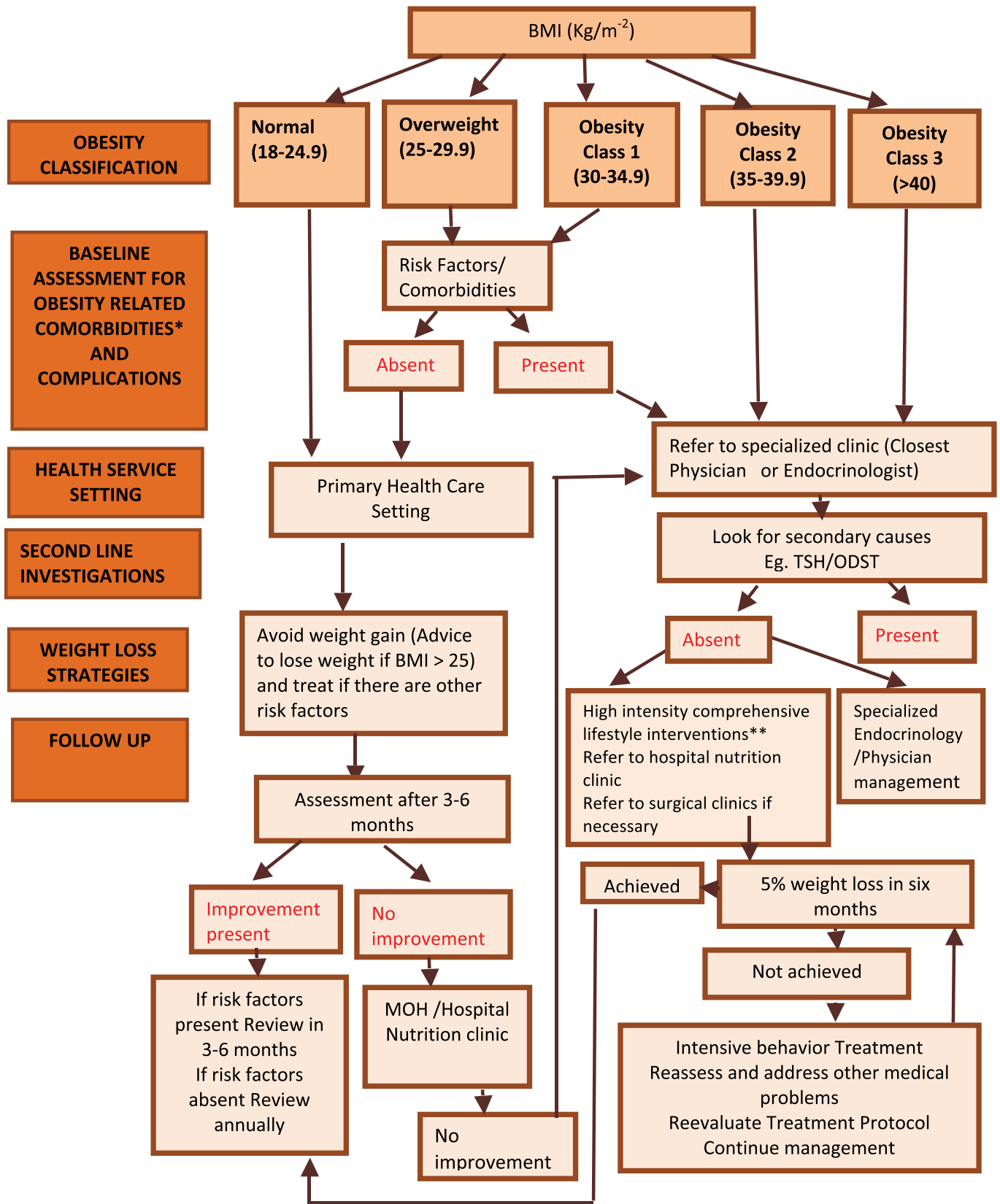
## BASIC INVESTIGATIONS

- FBS
- Lipid profile
- ALT/AST
- Gamma GT
- SE

Carryout following specific investigations when clinically suspicious cases.  
eg: Thyroid function test, Overnight dexamethasone suppression test etc.

# Management

Figure 1 - Management of Overweight and obesity



- **Comorbidities**-Endocrine and Metabolic Diseases, Cardiovascular Diseases, Pulmonary Disease, Gastrointestinal Disease, Neurological Disease, Genitourinary Disease in Women, Musculoskeletal disease, Cancers

E.g.: FBS, Lipid profile, Liver Function tests

## High-intensity Comprehensive Life Style Interventions

### 1 Balanced Low-Calorie Diet (Portion Control)

- Number of calories need for each day depend on weight, height, age, sex and activity level
- No caloric Beverages
- Minimum amount of bakery food products (Buns, Short-eats, Biscuits)
- Acceptable level of fat
- High levels of mono and poly unsaturated fats: (Avocado, Peanuts, Gingerly, Pumpkin seeds, Kottan)
- Low Levels of Saturated fats: (margarine / 1 coconut per day for 5 people/ deep fried food/ gravy)
- High amount vegetables (6 – 8 servings per day)
- 1 – 2 servings of fruits and legumes per day
- Use unsweetened dairy products 1 to 2 servings per day (yogurts, curd, milk, cheese)
- Fish or Poultry daily (Egg, small fish, chicken)
- Low amount of Red Meat and Meat Products

### 2 Exercise

- 150 min of Moderate-intensity aerobic physical activity throughout the week or 75 min of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of both.
- Muscle strengthening activities involving major muscle groups on 2 or more days a week.

### 3 Behavioral Therapy

- Setting realistic goals,
- Self-monitoring (food diaries and activity records)
- Slow down the eating process

## Dietary Modifications in the Management of Overweight and Obesity

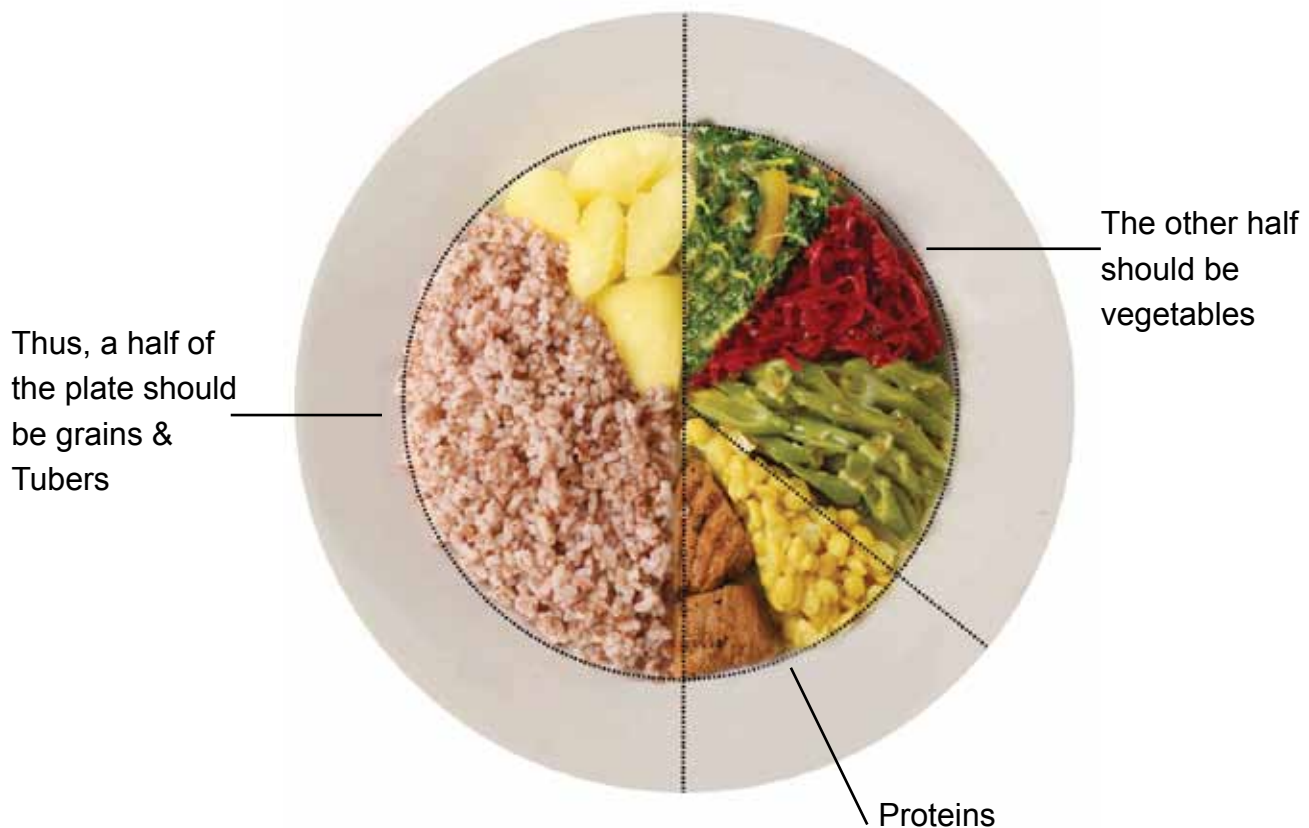
- The main requirement of a dietary approach to weight loss is that daily energy expenditure should be increased compared to total energy intake.
- At least a calorie deficit of 500 Kcal /day is needed to lose weight.

Acceptable range of weight for height of a person mentioned as annex IV.

### How to approach to an obese person

- take the 24 hour dietary recall (annex 5)
- Advice to modify the diet to a balanced low calorie diet considering personal preferences.

### Figure 2. Recommended food plate for a person with a normal BMI



**Figure 3. Modified Plate Model (Recommended food plate for a person with an Overweight and Obesity)**



### **Physical activity in the management of Overweight and obesity**

Physical activity (PA) or exercise training should be an integral part of any treatment plan for obese individuals regardless of their weight management goals <sup>19</sup>.

Main role of exercise is the prevention of weight regain rather than causing weight loss <sup>20</sup>.

E.g. To lose 500g an obese person has to run 7 Km every day for a week or consume 500kcal/day energy deficit diet for a week.

#### **Benefits of Exercise**

Modest contribution to weight loss in overweight and obese adults <sup>21</sup>.

May reduce abdominal fat<sup>21</sup>.

Increases cardiorespiratory fitness <sup>21</sup>.

Reduces cardiovascular and diabetes risks beyond that produced by weight reduction alone.

May reduce loss of muscle mass associated with diet.

## Classification of the intensity of physical activities

Metabolic Equivalents (METs) are used to indicate the intensity of Physical Activity (PA) level.

$$\text{MET} = \frac{\text{Person's working metabolic rate}}{\text{Person's resting metabolic rate}}$$

One MET is defined as the energy expenditure while sitting quietly (1 kcal/kg/hour)<sup>29</sup>

**Table 5- Classification of the intensity of physical activities**

Intensity	Degree	Example
Sedentary	Activities done sitting/lying down	Occupational Leisure (Watching Television, Computer use, Reading) Travel (In bus, car, train)
Light	Activities that require standing up and moving around	Housework (hanging out, washing, ironing, dusting, cooking) Working at a standing workstation
Moderate (Approximately 3-6 METs)	Activities are at an intensity that requires some effort, but allow a conversation to be held.	<ul style="list-style-type: none"> <li>• Brisk walking,</li> <li>• Gentle swimming</li> <li>• Dancing</li> <li>• Gardening</li> <li>• Gentle swimming</li> <li>• House work</li> </ul> Carrying /moving moderate loads (<20 kg)
Vigorous (Approximately > 6 METs)	Activities that lead to harder breathing, or puffing and panting (depending on fitness)	<ul style="list-style-type: none"> <li>• Aerobics</li> <li>• Jogging</li> <li>• Running</li> <li>• Fast cycling</li> <li>• Fast swimming</li> <li>• Competitive sports and games</li> </ul> Carrying /moving heavy loads (> 20 kg)

## General Advices

- The importance of sustained physical activity should be stressed.
- Advice should be given on a structured exercise program and patients should also be encouraged to increase “every day” activities such as walking rather than using a vehicle for short distance travel.



- Get down from the bus 2 halts prior to your destination. Cardiovascular and respiratory adequacy should be assessed prior to making a plan for exercise.
- Aerobic exercise is of greater value than other forms of exercise.
- A weight loss 5% - 10% provides significant health benefit and these benefits will be sustained through maintenance of weight and by participating in habitual physical activity. <sup>22,23</sup>.
- If physical activity or exercises combined with proper energy intake results in 9%-10% initial reduction in body weight <sup>24</sup>.
- Weight re-gain averaging approximately 33% - 50% of initial weight loss within one year of terminating treatment <sup>24</sup>.
- Exercise is initiated slowly, and the intensity increased gradually.

### American College of Sports Medicine (ACSM) recommendations for PA<sup>25</sup>

#### Recommendations for Physical Activity

- Maintaining health: 150 minutes per week (**30 minute per day for 5 days**)
- Prevention of weight gain: 150-250 minutes per week (**45 minute per 5 days**)
- Promote clinically significant weight loss: 225-420 minutes per week  
(**At least 1 hour per day for 5 days**)
- Prevention of weight gain after weight loss: 200-300 minutes per week  
(**At least 1 hour per day for 5 days**)

- For maintaining health-Initial goal- moderate levels of physical activity: 30 minutes for 5 days or 45 minutes for 3 days a week.
- Long-term goal-accumulate at least 30 minutes or more of moderate intensity physical activity on most, and preferably all, days of the week.
- To achieve weight loss, do moderate levels of physical activity for at least 5 hours (> 300 min) a week. Then gradually increase it to 60 to 90 minutes a day at least 5 days a week (to mobilize fat as for the fuel).
- It is important to understand that below 45 min of exercise the main fuel sources would be glucose and glycogen not the fatty acids from the fat stores. With continuous prolonged exercise it has been evident that even at thinking of starting exercise there has been surge of Free Fatty Acids (FFA) in to the blood as the prime source of fuel. This kind of physiological adaptation in energy metabolism facilitated by the prolonged moderate to vigorous aerobic exercise or physical activities<sup>26</sup>.

- Resistance training (Anaerobic exercises) E.g. Weight lifting can be cautiously added as an adjunct after the aerobic goal is achieved. Resistance training is valuable in minimizing muscle mass loss and is particularly beneficial in patients with diabetes, as it increases glucose uptake by muscles. Conduct muscle strengthening exercise 20 minute per day for 3 days per week.

High levels of PA and cardio respiratory fitness (CRF) attenuate the risk of obesity. Further, high level of CRF is associated with higher survival rates all body mass index (BMI) categories

27,28

## Follow up and Re-assessment

- Patients should be re-evaluated at predetermined intervals to assess the progress in the weight loss and possible complications of interventions.
- The target weight as well as rate of weight loss helps to assess the effectiveness of interventions.
- In early stages of obesity and specially young adults, with a good PA program people may not lose weight, but there will be reduction in fat mass and the waist circumference with increase bone and muscle mass.
- Patients should be assessed for possible complications of interventions as well. This can be due vigorous weight loss during a short period.
- Reasons for failure should be identified and remedial measures should be taken at this stage after reinforcing the patient's motivation for change.

## Behavior modifications in the management of obesity

Behavior therapy in weight control refers to, a set of principles and techniques for obese individuals to help them modify eating, activity, and thinking habits that contribute to their excess weight<sup>30</sup>.

### Behavioral change techniques

1. Self-monitoring of behavior and progress
2. Goal setting
3. Stimulus control (e.g. recognizing and avoiding triggers that prompt unplanned eating)
4. Cognitive restructuring (modifying unhelpful thoughts or thinking patterns)
5. Problem solving

## **Psychological therapies**

When combined with life style interventions, psychological therapies like behavior therapy and cognitive behavior therapy have shown to be more beneficial.

Teaching patients various methods for reducing stress and tension is crucial. Tension reduction techniques (e.g., diaphragmatic breathing, progressive muscle relaxation and meditation) should be taught to the patients.

## **Pharmacological Therapy in the Management of Obesity**

Although, pharmacological therapy of obesity is an area with exciting future advances, currently there are only a handful of approved drugs available for the use of the clinician.

Candidates for pharmacological agents for obesity are those with a:

- BMI  $\geq 25$  kg/m<sup>2</sup>, with one or more obesity related complications.
- BMI  $\geq 30$  kg/m<sup>2</sup>, without obesity related complications.

All currently approved weight-loss drugs act as anorexiant with the exception of orlistat, which inhibits the absorption of dietary fat<sup>31</sup>.

**Table 6 - Currently approved weight reducing drugs**

Obesity drug	Mode of action	Dosage	Effects	Expected weight loss	Common side-effects	Special considerations
<b>Orlistat (22,23)</b>	Binds to lipases in the GI tract and blocks the digestion of dietary triglycerides.	120 mg three times daily With meals	30% of ingested fat is unabsorbed and excreted. May Improve TC, LDL, TG, HbA1c	5% of the initial body weight, over one year.	Mostly GI-Oily spotting, flatus, fecal urgency/incontinence Fat-soluble vitamin malabsorption	Low-fat diet ( $\leq 30\%$ ) required to minimize side effects. Contraindicated in pregnancy/breast feeding. May interact with antiepileptics, warfarin, thyroxine.. Supplementation of vitamin A, D, E, K
<b>Lorcaserin* (24,25)</b>	Selective serotonergic 2C receptor agonist. Increases satiety and inhibits hunger effect.	10 mg twice daily	May improve HbA1c	5– 6% over one year	Headache, nausea, dizziness, fatigue	Hallucinogenic properties. Serotonin syndrome (do not combine with SSRI or MAOI)
<b>Phentermine*</b>	Induces central norepinephrine release leading to decreasing food intake.	15–30 mg daily		5% over 12 weeks	Dizziness, dry mouth, difficulty sleeping, irritability, nausea, vomiting, diarrhea or constipation	FDA approved for only 12 weeks continuous use.

Obesity drug	Mode of action	Dosage	Effects	Expected weight loss	Common side-effects	Special considerations
<b>Phentermine/topiramate * (26)</b>	In combination greater weight reduction than either agent alone.	Low-3.75/23 mg/d Mid-7.5/46 mg/d High-15/92 mg/d	May improve glycaemic control, dyslipidaemia and hypertension	5 – 11% over one year	Headache, paresthesia, dry mouth, altered taste, dizziness	Avoid pregnancy due to increased birth defects
<b>Liraglutide** (27)</b>	Selective glucagon-like peptide-1 (GLP-1) receptor agonist. Regulates appetite by decreasing hunger and increasing satiety.	3mg once daily Subcutaneously	May improve prediabetes, systolic BP, triglycerides.	5- 10% over one year	nausea, diarrhea, vomiting, hypoglycemia when used in combination with sulfonylureas. Rarely- acute pancreatitis, acute cholecystitis.	Increase heart rate by 2-3 bpm.
<b>Naltrexone (SR)/ Bupropion (SR) * (28)</b>	Dopamine and norepinephrine reuptake inhibitor and opioid receptor antagonist. Increases satiety and inhibits hunger effect.	Starting dose- 8/90mg daily Gradually increase up to, 32/360mg /d in 2 divided doses by 4 weeks	May improve- triglycerides, HDL, hs-CRP, HbA1c.	5% -10% over one year	Nausea, constipation, headache, vomiting, dizziness, insomnia, dry mouth, and diarrhea Risk for suicidal thoughts associated with bupropion	Contraindicated in patients with seizures, opioid use, abrupt cessation of alcohol, benzodiazepines and barbiturates. May increase BP and heart rate.

\* FDA approved for obesity management but not registered in Sri Lanka at the time of publication.

\*\* Registered in Sri Lanka for the treatment of Diabetes Mellitus.

- All weight loss medications are contraindicated in patients planning pregnancy or are currently pregnant.
- Pharmacological Therapy for obesity is far less effective when used alone with poor long-term maintenance of weight loss. Therefore it should always be combined with dietary and lifestyle modifications<sup>31</sup>.
- It is recommended to initiate therapy with dose escalation based on efficacy and tolerability<sup>45</sup>.
- Some obese patients do not respond to drug therapy, and long-term success is unlikely if weight loss does not occur within the first 12 weeks of treatment<sup>39</sup>.
- Maintenance of the weight loss can be achieved by long-term use of the drug, while short-term use can lead to weight regain.

### **Treatment of Diabetes in Obese Patients**

Weight gain is an undesirable result of treatment for diabetes, which leads to poor cardiovascular outcomes and increased insulin resistance.

In selecting an anti-diabetic medication for an obese diabetic, one can opt for medications with a favorable effect on weight such as Metformin, GLP- 1 analogs, DPP-IV inhibitors and SGLT-2 (not registered in Sri Lanka), while trying to avoid medication that aid weight gain, including sulfonylureas and thiazolidinedione.

Angiotensin converting enzyme inhibitors (ACEI), Angiotensin receptor blockers (ARB), calcium channel blockers rather than beta blockers should be used for hypertension in patients with diabetes and obesity.

### **Management of obesity in other medical conditions**

- Women with BMI >30kg/m<sup>2</sup> or >25kg/m<sup>2</sup> with co-morbidities, other contraceptive methods are preferred over injectable medications.
- Steroid sparing drugs should be considered when possible in the treatment of chronic inflammatory conditions
- Weight neutral antipsychotics should be used when indicated.
- Consider weight gain potential in choosing antiepileptics
- Monitoring the weight, waist circumference of patients on antiretroviral therapy due to unavoidable weight gain and fat redistribution.
- Sympathomimetic weight loss medications such as phentermine, diethylpropion in patients with uncontrolled hypertension or heart disease should be avoided<sup>51</sup>.

## **Surgery in the Management of Obesity**

Bariatric surgery aims to reduce food intake by restricting gastric capacity and/or reducing uptake by reducing exposure to the small bowel absorptive area.

Bariatric surgery has been shown to be the most effective and durable treatment for morbid obesity. Compared to medical therapy bariatric surgery has resulted in excellent outcomes including remission of diabetes and other co morbidities and significant improvement in quality of life. It also improves cardio vascular outcomes and survival <sup>40</sup>.

### **Indications for Bariatric Surgery** <sup>(31-34)</sup>

Patients in age groups from 18 to 65 years:

1. With BMI  $\geq 35$  kg/m<sup>2</sup> (even when there are no medical problems)
2. With BMI  $\geq 30$  kg/m<sup>2</sup> with  $\geq 1$  obesity related co-morbidities such as:
  - Type2 Diabetes Mellitus
  - Hypertension
  - Hyperlipidaemia
  - Obstructive Sleep Apnoea/ Obesity Hypoventilation Syndrome
  - Non Alcoholic Fatty Liver Disease / Non Alcoholic Steatohepatitis
  - Asthma, venous stasis
  - Debilitating arthritis
  - Impaired quality of life

Note:

- BMI criterion may be the current BMI or previously maximum attained BMI of this severity.
- To be considered for surgery, patients should have failed to lose weight or to maintain long-term weight loss, despite appropriate surgical and/or non-surgical comprehensive medical care.
- Patients should have shown their compliance with scheduled medical appointments.

### **Contraindications for Bariatric Surgery**

- Absence of a period of identifiable medical management.
- Patient who is unable to participate in prolonged medical follow-up.
- Non-stabilized psychotic disorders, severe depression, personality and eating disorders, unless specifically advised by a psychiatrist experienced in obesity.
- Alcohol abuse and/or drug dependencies.
- Diseases threatening life in the short term- eg. Pulmonary hypertension
- Patients who are unable to care for themselves and have no long-term family or social support that will warrant such care.

## **Types of bariatric procedures**

### **Sleeve Gastrectomy (SG)**

This surgery involves removing the greater portion of the fundus and body of the stomach, reducing its volume from up to 2.5 L to about 200mL. This procedure provides fixed restriction and does not require adjustment like LAGB.

### **Mini Gastric Bypass**

A mini gastric bypass creates a long narrow tube of the stomach along its right border (the lesser curvature). A loop of the small gut is brought up and hooked to this tube at about 180 cm from the start of the intestine. This results in restriction of food intake and modest malabsorption of nutrients.

### **Laparoscopic Adjustable Gastric Banding (LAGB)**

This surgery involves placing a band around the stomach near its upper end to create a small pouch. This restricts intake of food. The band can be tightened or loosened over time to change the extent of restriction.

### **Roux-En-Y Gastric Bypass (RYGB)**

This is a combination procedure in which a small stomach pouch is created to restrict food intake and the lower stomach, duodenum and first portion of the jejunum are bypassed to produce modest malabsorption of nutrients and thereby kilo joule intake.

### **Biliopancreatic Diversion (BPD)**

This is also a combination procedure that involves removing the lower part of the stomach, and bypassing the duodenum and jejunum to produce significant malabsorption. This procedure is no longer recommended for Asians.



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## ANNEXURES

### Annexure 1: Formula for Calculation of BMI

$$\text{BMI} = \frac{\text{Body weight (kg)}}{\text{Height}^2 \text{ (m)}}$$

## Annexure 2 : Measuring Height

Equipment's to measure height: you need a portable height/length measuring board, such as from SECA. Alternatively, a BMI scale measuring both height and weight (e. g. Growth Management Scale) can be used.

### Assembling the measuring board

Follow the steps below to assemble the measuring board:

- 1 Separate the pieces of the board (usually 3 pieces) by unscrewing the knot at the back.
- 2 Assemble the pieces by attaching each one on top of the other in the correct order.
- 3 Lock the latches in the back.
- 4 Position the board on a firm surface against a wall.

Follow the steps below to measure the height of a participant:

- 1 Ask the participant to remove their:
  - Footwear (shoes, slippers, sandals, etc)
  - head gear (hat, cap, hair bows, comb, ribbons, etc).
  - Any fancy or high hairdos may have to be pressed.

Note: If it would be insensitive to seek removal of a scarf or veil, the measurement may be taken over light fabric.

- 2 Ask the participant to stand on the board facing you.
- 3 Ask the participant to stand with:
  - Feet together
  - heels against the back board
  - knees straight.
- 4 Ask the participant to look straight ahead and not tilt their head up.
- 5 Make sure eyes are the same level as the ears.
- 6 Move the measure arm gently down onto the head of the participant and ask the participant to breathe in and stand tall.
- 7 Read the height in centimeters at the exact point to the nearest mm.
- 8 Ask the participant to step away from the measuring board.
- 9 Record the height measurement in centimeters in the Android device, along with the device ID and your Technician ID.

(Source-WHO Stepwise Approach to Surveillance (STEPS) protocol<sup>52</sup>)

## Annexure 3 - Measuring Weight

Equipment's to measure weight: you will need a portable weighting scale, such as a SECA scale or the Tanita HS301 Solar Scale. Alternatively, a BMI scale measuring both height and weight (e. g. Growth Management Scale) can be used.

### Set up requirements

Make sure the scales are placed on a firm, flat surface. Do not place the scales on:

- Carpet
- a sloping surface
- a rough, uneven surface.

Set up scales. Follow the steps below to put the scales into operation:

- 1 Put the scale on a firm, flat surface.
- 2 Connect the adaptor to the main power line or generator, if the scale is not battery operated.
- 3 Turn on the scale and wait until the display shows 0.0.

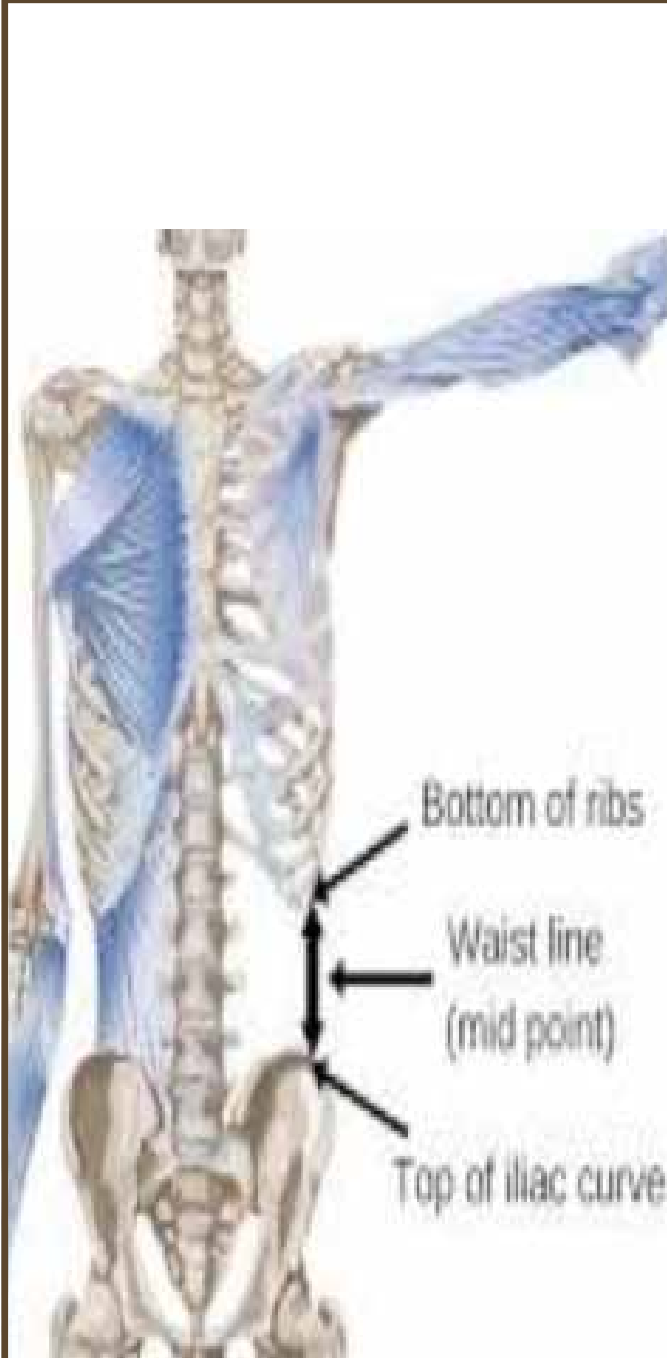
Follow the steps below to measure the weight of a participant:

- 1 Ask the participant to remove their footwear (shoes, slippers, sandals, etc) and socks. They should also take off any heavy belts and empty out their pockets of mobiles, wallets and coins.
- 2 Ask the participant to step onto scale with one foot on each side of the scale.
- 3 Ask the participant to: • stand still • face forward • place arms on the side and • wait until asked to step off.
- 4 Record the weight in kilograms on the Android device, along with the device ID and your Technician ID.

(Source-WHO Stepwise Approach to Surveillance (STEPS) protocol<sup>52</sup>)

## Annexure 4: Procedure for measuring waist circumference

WHO Stepwise Approach to Surveillance (STEPS) protocol<sup>52</sup> provides a detailed guide for measurement of waist circumference.



**Waist circumference measurement technique**

- Waist circumference should be measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch-resistant tape to reduce differences in tightness.
- Tape should be parallel to the floor at the level at which the measurement is made. The subject should stand with feet close together, arms at the side and body weight evenly distributed, and should wear little clothing.
- The subject should be relaxed. This can be achieved by asking subject to take deep natural breaths before taking measurements.
- Measurements should be taken at the end of a normal expiration as fullness of the lungs and position of diaphragm influences the accuracy of the measurement.
- Measurement should be repeated twice; if the two measurements are within 1 cm the average should be calculated. If the difference between the two measurements exceeds 1 cm, measurements should be repeated.

## Annex 5 - Acceptable weight range for of a Person

Height (Feet & Inches)	Ideal Weight (kg ) ( BMI $\geq$ 18.5 - $\leq$ 23)
5'	43 - 53
5' 1"	44 - 56
5' 2"	46 - 57
5' 3"	47 - 59
5' 4"	49 - 61
5' 5"	50 -63
5' 6"	52 - 65
5' 7"	53 - 67
5' 8"	55 - 68
5' 9"	56 - 71
5' 10"	58 - 73
5' 11"	60 - 75
6'	62 - 78



## Annex 6 - 24 Hour Dietary Recall Form

(Details on the food consumption within last 24 hours)

Name: .....

Age: .....

Date: .....

Time*		Food type and quantity/(Put the number of sugar spoons used for a tea)
6.00am	Morning tea	
8.00am	Breakfast	
10.30am	Snack/Tea	
12.30noon	Lunch	
4.00pm	Evening tea	
7.00pm	Dinner	

\*The time can be vary from person to person, you can mention the exact time of having the meal.

## Annex 7 - Recommended number of daily servings to a person with a normal BMI from each food group

Food group	No. of servings
Rice, bread, other cereals and yams	6 – 11
Fruits	2-3
Vegetables	3- 5
Milk and / or milk products	1-2
Fish, pulses, meat and eggs	3- 4
Nuts and oil seed	2-4

*(Source: Food based dietary guidelines, 2011. Ministry of Health)*

## Annex 8- Serving Sizes

1 cup=200 ml tea cup

Food type	Size of a one portion	Calorie value
<b>Cereals &amp; starchy foods</b>		
Cooked rice	1 cup (120 g)	160 Kcal
Bread	50g(2 slices of bread)	
<b>Vegetables</b>		
Cooked vegetables (fruit veg. & leafy veg)	3 tbsp (½ cup)	25-40 Kcal
Raw salads	1 cup (200 ml)	
<b>Fruits</b>		
Medium size fruit	1 banana	50 kCal
	1 orange	50 Kcal
Cut fruit / fruit salad	½ cup	
Dried fruits	2 tbsp (20-30) g	
<b>Fish, pulses, dried fish, egg, poultry and meat</b>		
Cooked fish/ poultry/ meat	30 g	40-80 Kcal
Cooked pulses	3 tbsp	
Eggs	1	75 Kcal
Dried fish	15 g	
<b>Milk &amp; dairy products</b>		
Milk	1 cup (200 ml)	
Yogurt/ curd	1 cup (100 ml)	60-80 Kcal
Milk powder	30 g (2 tbsp)	
<b>Nuts &amp; oil seeds</b>		
	1 tbsp (15 g)	
Cooked items : quantities measured without gravy		

*(Source: Food based dietary guidelines, 2011. Ministry of Health)*

## **Annex 9: Calorie values of a Commonly Consumed food products Select Foods on your Daily Calorie needs**

<b>Food Category</b>	<b>Average Energy(kcal)</b>
3 table spoon of vegetables(50g)	25-40
3 table spoon of leafy vegetables (50g)	25-40
1 table spoon of pol sambol	45
Egg omelet	120
1 table spoon of cooked dhal	25
1 tea cup of boiled green gram(150g)	150-170
1 tea cup of boiled kadala(150g)	150-200
1 slice of pittu(50g)	141
6 string hoppers (75g)	160
1 thosai(50g)	80
1 pizza(100g)	271
Medium size rotti(50g)	171
1 hopper(50g)	50
1 cup of tea (3 tea spoon of milk powder+ 1 tea spoon of sugar)	90
Plain tea(2 tea spoon of sugar)	32
Chinese roll	150 – 200
Dhal wade(50g)	100 – 150
1 bun (50g)	155
Curd (100g)	100
1 apple(100g)	50
2 slices of pineapple(100g)	46
Papaw (100g)	32
Cola 330ml	140
Chocolate cake(40g)	143
Cashew nut (28g)	165

*(Source-Canteen guidelines, nutrition division)*

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Guideline on Management of  
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