

METABOLIC SYNDROME

Metabolic Syndrome (MS) is a condition characterised by central obesity, hypertension (HTN), glucose intolerance and insulin resistance. Metabolic Syndrome increases the risk of development of cardiovascular disease (CVD) and Type 2 diabetes and deaths due to CVD. The primary risk factors for Metabolic Syndrome include insulin resistance and abdominal obesity, which are highly prevalent in Indians. It is estimated that approximately 25% of the world's population has Metabolic Syndrome. Nearly 30 % of Indians have metabolic syndrome disorder. Treatment of Metabolic Syndrome begins first with therapeutic lifestyle changes (healthy eating habits and physical activity). Metabolic syndrome is also known as syndrome X, metabolic syndrome X, cardiometabolic syndrome, insulin resistance syndrome.

Diagnostic criteria for MS in Indians:

- 1) Waist circumference in Indian men: greater than 35”; Indian women: greater than 31”
- 2) High triglyceride: Equal to or greater than 150mg/dl
- 3) Low HDL (good) cholesterol: <40 mg/dl for men, <50 mg/dl for women
- 4) High blood pressure: equal to or greater than 130/85 mm Hg
- 5) High fasting blood glucose: 110 mg/dl (pre diabetes)

Clinical diagnostic criteria for Metabolic Syndrome:

RISK FACTOR	WHO	Updated NCEP	ASIAN INDIANS/IDF
Fasting plasma glucose	----	≥ 100 mg/ dL	≥ 100 mg/ dL
Abdominal obesity <ul style="list-style-type: none"> • Waist circumference • Body mass index • Waist hip ratio 	> 102/94 cm - Men > 88/80 cm -Women > 25 kg/m ² > 0.90 -Men > 0.85 -Women	> 102 cm -Men > 88 cm -Women ----	> 90 cm -Men > 80 cm -Women > 23 kg/m ² > 0.9 -Men > 0.8 -Women
Dyslipidemia <ul style="list-style-type: none"> • Triglyceride • High-density lipoprotein • cholesterol 	> 150 mg/dL < 35 mg/dL –Men < 30 mg/dL -Women	≥ 150 mg/dL < 40 mg/dL –Men < 50 mg/dL -Women	≥ 150 mg/dL < 40 mg/dL -Men < 50 mg/dL -Women
.Blood pressure	≥ 140/ ≥ 90 mmHg	≥ 130/ ≥ 85 mmHg	> 130/ > 85 mmHg
*Misraetal JAPI 2009			

The following thumb rules may be followed to be free from components of MS:

- Body mass index (BMI) to be maintained at 23 or less (20 to 23)
- Increased physical activity, with a goal of at least 30 minutes of moderate-intensity activity on most days of the week. Seek your physician's approval before starting your exercise program.
- Healthful eating habits that include regular intake of seasonal fruits and vegetables, reduced intake of salt and oils and fats. Restricted intake of fatty meat. Hydrogenated fats (dalda) to be avoided completely. Bakery foods are mostly prepared with dalda.

General health tips:

- Restrict intake of processed foods (biscuits, cookies, bread, cakes, health drinks, sauce etc) as most of them are high in salt, sugar and fats (oil).
- Restrict intake of beverages as they are high in salt and sugar.
- Have meat alternatives like beans, lentils, nuts, seeds and paneer. That way you consume less of saturated fats
- Use vegetable oils like canola, olive and soya bean to restrict intake of omega 6 and increase intake of omega3 and monounsaturated fats.
- Use small amounts of vegetable oils in stir frying or sautéing; a tea spoon (5ml) is usually enough. Oil intake should be restricted to not more than 20 to 25 ml per individual per day.
- At restaurants check the nutrition information of menu items before you order, and choose foods with less fat. Invariably restaurants use lot of oil in most of their menu, therefore restrict to smaller portions.

Diet Plan for metabolic syndrome patient based on 2000 Calories per Day

- Fruits and vegetables: Cooked/raw vegetables three cups (1 cup each for breakfast, lunch and dinner) leafy vegetable may be substituted for 1 cup vegetable. 1 to 2 fruits per day.
- Legumes or lentils: Vegetarians: 7 times per week e.g. 1 cup cooked lentils, daal, rajma, channa per day. Non-vegetarians may substitute lean meat with 1 cup lentil once or twice a week.
- Whole grains: 3 servings (each serving - 100gm cooked) per day; choose from whole grains like whole wheat chapatti without oil or a cup of boiled rice (preferably brown rice). Millets such as ragi or jowar may substitute cereals for at least three servings per week.
- Fibre: 30g per day that includes 7 to 13 gm soluble fibre (legumes, vegetables, fruits, whole grains (bran cereal), rye, brown rice if included in daily diet will provide 30g fibre.)

- Fats & oils: oils must be used sparingly- 4 to 6 teaspoon (20 to 30ml)oil per day per individual. Choose monounsaturated or polyunsaturated oils (Eg: Canola, corn, olive, soybean, safflower oil). Do not choose oils that have high N6 and nil N3 fat (appropriate ratio of N3 and N6 fats is essential). Avoid bakery items that contain hydrogenated fats (dalda).
- Include low fat milk products: 2 servings per day (curd or buttermilk),
- Nuts and seeds: 2 to 4 times per week (2 tablespoon or 1 oz seeds nuts, avoid macadamia nuts and salted nuts).
- Sugar: limit to 5 servings week (1 serving = 1 tablespoon sugar or jelly or jam)
- Saturated fats must be limited to 7% of total energy intake (meat or chicken skin, packaged desserts, wholemilk, ice cream, butter, cheese, sour cream are sources of saturated fats).
- Avoid Trans-fatty acids - 0 grams (found in processed foods e.g. Biscuits, chips, Indian savoury snacks and fried foods).
- Table salt: 1500 mg per day (Most processed foods are high in salt- read food labels, prepare food with as little salt as possible)
- Include regular physical activity such as walking for a minimum of 30 minutes and yoga on most days of the week.

Foods to be preferred and to be limited and completely avoided even by normal individuals

Foods	Prefer	Limit	Avoid
Cereals	Whole wheat, brown rice, Ragi, Bajra, maize, Jowar	Preparation with maida such as white bread, cakes, biscuits, pastries, Noodles and fast foods. Polished rice	Avoid too much of sweets and deep fried wheat or rice preparations.
Pulses	green gram, Redgram, black gram, kidney beans, lobia, peas etc. Whole and sprouted dhals	Deep fried pulse preparations	
Vegetables	Green leafy vegetables and other vegetables	Roots and tubers	Deep fried vegetables, banana chips, canned vegetables.
Fruits	Fresh fruits, Fresh fruit juices without sugar	Fresh fruit juices with sugar	canned fruits

Dairy products	Low fat milk, butter milk , skimmed milk , curd/yoghurt	Whole milk , milk powder, cheese, paneer, butter	khoa, condensed milk, milk cream
Eggs	Egg white	Egg yolk	
Animal food	Fish	Chicken, lean meat	Prawns, shrimps, all types of fatty meat
Fats	More than one type of vegetable oil	Limit total fat intake	Oily dishes, butter, ghee, coconut oil, deep fried foods. Transfats to be avoided completely.
Sugar and sugar products		Limit chocolates Limit Sugar in any homemade beverages or preparations.	Sweets, sweet biscuit and ice creams
Nuts and oil seeds		All nuts and oil seeds	
beverages	Fresh fruit juice(without sugar), light tea ,	Coffee,	Alcohol, cola, and soft drinks
Salt	Foods in natural state	Too much salt in preparation	Pickles, papads, sauces, salt biscuit, fried crispies .

Source:-NIN publication of diet in heart diseases

Major Types of Fatty Acids in Fats and Oils

Saturated	Mono unsaturated	Polyunsaturated	
		linoleic (n-6)	α -linolenic (n-3)
Coconut Palm kernel Ghee/butter Vanaspati	Red palm oil Palmolein Groundnut Ricebran Sesame	Low	Red palm oil Palmolein
		Moderate	Groundnut, Ricebran Sesame
		High	Safflower, Sunflower Cottonseed, Corn, Soyabean
			Rapeseed, Mustard, Soyabean

Source: Dietary guidelines for Indians-Final draft

Fats and sources:

- Fats in foods are broadly grouped into saturated, monounsaturated and polyunsaturated fatty acids based on their chemical nature
- There are several fatty acids in each group. Fats from meat, animal fats (ghee and butter) and animal foods like milk, milk products and coconut oil, palm oil provide saturated fatty acids.

- The short and medium chain saturated fatty acids are present in ghee, butter and coconut oil, are easily digested and absorbed and are therefore, good for infants and young children.
- However, high intake of saturated fatty acids increases atherogenic risk and their intake should be limited in adults.
- Oils from sources such as palm, groundnut, cottonseed, sesame and olive are rich in monounsaturated fatty acids as compared to other oils.
- Linoleic (n-6) and α -linolenic (n-3) acids are the simple PUFA which are present only in oils from plant sources
- All vegetable oils (except coconut) are good sources of linoleic (n-6) acid. Soya bean, rapeseed and mustard oils are the only vegetable oils which contribute significant proportion of α -linolenic (n-3) acid. Legumes/pulses mustard and fenugreek seeds and green leafy vegetables are also are good sources of -linolenic (n-3) acid.
- On the other hand, fish and fish oils provide long chain n-3 fatty acids which are biologically more - active than -linolenic (n-3) acid present in plant foods

Triglycerides

Triglycerides are a type of fat found in the blood. If triglycerides levels are high, they can increase the risk of heart disease. Triglycerides are stored in the fat cells. When caloric intake is excessive, the additional calories are converted into triglycerides (fat) and stored in fat cells. This is how the body stores its body fat. Take your triglyceride number seriously. Extremely high triglyceride can cause pancreatitis (inflammation of the pancreas). Overweight / obesity, lack of exercise can increase triglyceride levels in blood.

National Cholesterol Education Program (NCEP) cut points for normal to very high Triglyceride levels

Normal Less than	150mg/dL
Borderline-high	150-199 mg/dL
High	200-499 mg/dL
Very High	500 mg/dL or higher

To lower triglycerides the National Cholesterol Education Program Adult Treatment Panel III recommends:

- 1 Weight loss of 7 to 10% of body weight should be encouraged if indicated.
- 2 Avoid excessive intake of carbohydrate (not more than 50% of calories) especially refined carbohydrates e.g. sugar and sweets
3. Choose fats wisely and lower the intake of fat to not more than 35% of calories in the diet.
4. Eat plenty of vegetables, fruits and whole grains, non-fat milk and non -fat dairy products,

choose fatty fish, lean meat and lean meat alternatives e.g. tofu, soybeans lentils and legumes.

5. Abstain or limit alcohol intake according to your doctor's advice.

6. Include regular physical activity such as walking for a minimum of 30 minutes on most days of the week.

Diagnostic criteria for MS by American Heart Association/Updated NCEP

- Elevated waist circumference:
 - Men — greater than 40 inches (102 cm)
 - Women — greater than 35 inches (88 cm)
- Elevated triglycerides: Equal to or greater than 150 mg/dL (1.7 mmol/L)
- Reduced HDL ("good") cholesterol:
 - Men — Less than 40 mg/dL (1.03 mmol/L)
 - Women — Less than 50 mg/dL (1.29 mmol/L)
- Elevated blood pressure: Equal to or greater than 130/85 mm Hg or use of medication for hypertension
- Elevated fasting glucose: Equal to or greater than 100 mg/dL (5.6 mmol/L) or use of medication for hyperglycemia.

Diagnostic criteria for MS by the World Health Organization (1999) include individuals with insulin resistance, impaired glucose tolerance, impaired fasting glucose or diabetes mellitus and two of the following:

- Blood pressure: $\geq 140/90$ mmHg
- Dyslipidemia: triglycerides (TG): ≥ 1.695 mmol/L and high-density lipoprotein cholesterol (HDL-C) ≤ 0.9 mmol/L (male), ≤ 1.0 mmol/L (female)
- Central obesity: waist:hip ratio > 0.90 (male); > 0.85 (female), or body mass index > 30 kg/m²
- Microalbuminuria: urinary albumin excretion ratio ≥ 20 μ g/min or albumin:creatinine ratio ≥ 30 mg/g

Diagnostic criteria for MS by the International Diabetes Federation include:

- A waist circumference of > 90 cms for men and >80 cms for women (abdominal obesity)
- A triglyceride level of >150 mg/dl (Atherogenicdyslipidemia)
- A HDL-cholesterol level of < 40 mg/dl for men and <50 mg/dl for women (Atherogenicdyslipidemia)
- A blood pressure of $> 130/85$ mm HG
- A fasting plasma glucose of >100 mg/dl or previously diagnosed type 2 Diabetes

References

- 1) The Practical Guide: Identification, Evaluation and Treatment of Overweight and Obesity in Adults: Bethesda, Md: National Institute of Health National Heart Lung & Blood Institute; 2000. NIH Publication No 00-4084
- 2) The Importance of Population-Wide Sodium Reduction as a Means to Prevent Cardiovascular Disease and Stroke: A Call to Action from the American Heart Association. Published on line Circulation Jan 13, 2011
- 3) Indian Foods: AAPI's guide to nutrition, health and diabetes "second edition"
- 4) Eva Kassi, Panagiota Pervanidou, Gregory Kaltsas and George Chrousos. Metabolic syndrome: definitions and controversies. BMC Medicine 2011, 9:48.
- 5) Scott M. Grundy, H. Bryan Brewer, Jr, James I. Cleeman, Sidney C. Smith, Jr and Claude Institute/American Heart Association Conference on Scientific Issues Related to Definition of Metabolic Syndrome : Report of the National Heart, Lung, and Blood