Diet to Prevent Heart Disease and Metabolic Syndrome

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With heart disease and its precursor metabolic syndrome taking malignant proportions among Indians, strategies to deal with it must be urgent and aggressive to say the least.

South Asians including Indians have a tendency for metabolic obesity, characterized by preferential deposition of fat around the abdomen – also called "abdominal or central obesity." It results from hyperinsulinemia. "Hyperinsulinemia" and associated insulin resistance lead to high blood triglyceride levels, low HDL-C, high uric acid, fatty liver, inflammation and increased clotting tendency of blood, abdominal obesity and increased risk of hypertension, diabetes mellitus (DM) and cardiovascular disease (CVD). The constellation of these biochemical or metabolic abnormalities is referred to as the "metabolic syndrome." The risk for metabolic syndrome and CVD can be reduced by more than 95% by controlling the key modifiable factors – diet and exercise.

Diet can modify risk for CVD by

- slowing progression of existing lesions,
- inducing regression of existing lesions,
- preventing the formation of new lesions, and
- preventing thrombotic events.

Goals to be attained are achieving and maintaining:

ideal body mass index (BMI) < 23 Kg/m^2

1. waist and hip circumference less than 80 cm for women and 90 cm for men
2. cholesterol levels as follows:

Parameters	Cholesterol levels (mg/dL)
Total cholesterol	<200
Triglycerides	<150
HDL	>40 (males) >50 (females)
LDL	<100

3. blood glucose levels (F<100 mg/dL)
4. blood pressure (<140 mmHg systolic and <90 mmHg diastolic)
5. homocysteine levels

Dietary Factors Influencing Heart Health

1. Calories
2. Carbohydrates
3. Dietary fiber
4. Dietary fat
   - Saturated fatty acids (SFAs)
   - Polyunsaturated fatty acids (PUFAs)
     - n-3 PUFAs
     - n-6 PUFAs
   - Monounsaturated fatty acids (MUFAs)
   - Trans fatty acids (TFAs)
5. Cholesterol
6. Sodium
7. Antioxidants, functional foods and phytonutrients
8. Caffeine
9. Alcohol

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Calories

Caloric adjustments may be required to attain or maintain ideal body weight. Usually, 20–30 Kcals/kg ideal body weight per day are adequate to achieve this. A 500 kcal/d reduction in the existing diet usually results in a weekly loss of 500 g.

Standard weight loss diets provide 500–1000 fewer calories than estimated to be necessary for weight maintenance and initially result in a loss of about ½–1 kg a week. Although many people can lose some weight (as much as 10% of initial weight in about 6 months) with such diets, without continued support and follow-up, they usually regain the weight they have lost. Long-term and short-term goals must be clearly established before starting weight management. While it may be desirable to become calorie-wise, nutrition adviser is better communicated for long-term compliance in terms of food groups, portion sizes and principles.

Carbohydrates

While traditional diets provide upto 60–70% of total calories from carbohydrates, recommended allowance for carbohydrates is generally 50–60% of total energy. Several studies have reported benefits of lowering carbohydrate calories and stepping up protein and fat. Most do well, with 45–50% or less than 200 g of carbohydrates for a 1500-kcal diet. Carbohydrates in the diet come from grains, starches, legumes, dairy, fruits, vegetables, sugars and sweets.

Besides, the total amount of carbohydrates, the type or the quality of the carbohydrate also play an important role. Glycemic index (GI) estimates the potential of different foods to raise blood glucose after ingestion, thereby impacting insulin metabolism.

Several factors including cooking, extent of processing and fiber, fat and protein content influence GI. While cooking and processing raise GI, fiber, fat and protein lower it.

Foods with low GI are digested slowly and cause a slower rise in blood glucose and thereby have a better insulin response; however, foods with high GI trigger a sharp increase in blood glucose, followed by a dramatic fall and inducing insulin imbalance.

Low GI foods

- increase satiety and are of significance for weight watchers and
- improve blood glucose, triglycerides, LDL, possibly inflammation, endothelial function and fibrinolysis.

Carbohydrates with low GI typically include oats, barley, amaranth, quinoa, legumes, lentils and beans including soy, nuts and seeds, low-fat dairy (milk and yogurt), fruits and raw vegetables**.**

GI of our diet can be lowered by

- avoiding added sugars to beverages, sweets, sweetened beverages, fruit juices, mocktails and cocktails,
- reducing intake of refined carbohydrates – maida, polished rice, bread and bakery products,
- combining high GI foods with low GI foods,
- decreasing portions of high GI foods, and
- replacing high GI foods with vegetables and fruits.

Dietary fiber

Dietary fiber plays an important role in maintaining our health and protecting against many diseases like obesity, heart disease and diabetes.

Good sources of fiber include whole grains like oats, barley, millets, ragi, amaranth, whole wheat flour (atta), brown rice, pulses, legumes, fruits and vegetables including green leafy vegetables, fruits like amla, apricots or prunes, citrus fruits, kiwi, strawberries, bael (woodapple) and pomegranate, low-fat dairy, nuts and seeds like flaxseeds, sunflower seeds, watermelon seeds.

Fiber is of two types:

- Insoluble – laxative benefits can be attributed to bulk-forming properties of insoluble fiber
- Soluble – it is known for its heart-protective and other health benefits

Soluble fiber works by binding bile acids which are made of cholesterol and shunting them out of the body before they can be recycled; thus the body must make more of those bile acids for the digestive process and to do so it must turn to the cholesterol in the blood. Little by little, as more bile acids are eliminated and more cholesterol is

used to manufacture more bile acids, cholesterol levels in the blood drop.

How much fiber is good?

- The optimum requirement of fiber varies from one individual to another. Fiber intake of 30–40 g should be targeted for normal bowel function.
- A diet rich in whole grains, pulses, vegetables, fruits, nuts and seeds is likely to provide adequate fiber, that is, 25–35 g/d.
- Fiber supplements or excessive fiber can have undesirable effects. Fiber supplements must be taken under supervision.
- Increasing fiber in diet
- Increase fiber gradually, especially if using supplements.
- Extra fiber is best tolerated in divided doses.
- Additional fiber must be accompanied with additional water.

Protein

Protein intake should be based on body weight. This should be 0.75–1 g/kg/d, considering the quality of protein in a usual Indian vegetarian diet. for example, a man weighing 60 kg would require 45–60 g of protein a day.

In conjunction with energy intake, the protein intake should provide 10–15% with a maximum of 20% of the total calories.

Good-quality protein sources include lean meat, poultry, fish, eggs, milk, cheese and soy.

High-protein diets (>20% of total energy), like the Atkin's diet, are not recommended, as excess protein intake can strain kidneys and eventually lead to kidney damage, tilt the acid–base balance of your body, hyperacidity, and other digestive complaints. Excess protein may cause hyperurinemia leading to joint pains and gout. Excess protein, especially the animal protein, could leach calcium from bones, thus increasing susceptibility to osteoporosis and could also lead to increase in serum cholesterol levels.

Fish. Studies have reported that fish intake decreases mortality due to coronary heart disease (CHD) by 15% (once a week), 23% (2–4 times a week), and 38% (≥5 times a week).

Soybeans contain isoflavones which have powerful antioxidant properties ideal for protection against heart disease and stroke. Adding 25 g of soybean protein to the diet lowers blood cholesterol levels by 12–15%. Isolated soy proteins or isoflavones also reduce LDL-C modestly (~3%).

Nuts have favorable effects on blood lipids and cholesterol reduction and also lead to lower incidence of CHD. Nuts include almonds, pistachios, walnuts, pinenuts, cashewnuts and peanuts. A meta-analysis of seven studies showed that ½–1 cup of almonds led to reduction in total cholesterol and LDL-C by as much as 5–10% for subjects with high cholesterol levels.

Dairy. Long-term observational studies suggest that dairy products are associated with lower risk of CHD, stroke, DM, and metabolic syndrome. Conjugated linoleic acid (CLA)**,** a variant of the essential fatty acid, is found in dairy products such as milk, cheese and butter, and in the meat of cattle and lamb. It is a *trans fat*, but it is not harmful as other trans fatty acids. CLA helps in lowering cholesterol and reduces arterial plaque build up.

Dietary fats

Fats are a concentrated source of energy and provide satiety; 20–30% of total calories in a diet must come from fats. Fat intake should be individualized based on weight, cholesterol levels and blood glucose needs. Sources of good fat include nuts, seeds, fatty fish, cold pressed oils, etc.

Very low fat diets are counter-productive as they are lower in satiety and inherently high on carbohydrates, predisposing to insulin resistant or metabolically obese individuals to increased risk of heart disease.

Along with the quantity of fat, quality of fat is also important. A diet high in MUFA, low in SFAs with no trans fats can be helpful. Choose blended oils such as mustard, canola, sesame, rice bran and olive oil.

The primary goal with respect to dietary fat to reduce risk for CVD is to

- include desirable n-3 PUFAs,
- limit n-6 PUFAs, SFAs and cholesterol intake, and
- avoid TFAs.

Recommendations of fats for Asians	
SFA	<10% total energy
MUFA	10–15% total energy
PUFA	<7% total energy
n-3 PUFA	1–2 % total energy
Trans fats	<1% total energy <2% total fat
Dietary cholesterol	200–300 mg/d
Desirable n6–n3 ratio	1:5

*Saturated fatty acids***.** SFAs are the principal dietary determinants of plasma LDL-C. It is established that high-SFA diets induce adiposity and insulin resistance. Reducing SFAs, cholesterol and TFA intake decreases plasma total and LDL-C. Reducing SFAs may also reduce HDL-C.

Rich sources of SFAs are butter, desi ghee, coconut oil and palm oil.

Not all SFAs in natural fats are atherogenic. Butter, desi ghee and coconut oil as a part of a healthy diet are not contraindicated. Epidemiological and experimental data regarding coconut-eating groups note that dietary coconut oil leads neither to high serum cholesterol nor to high CHD. A study conducted in 2004 at University of Kerala demonstrated the potential beneficiary effect of virgin coconut oil in lowering lipid levels in serum and tissues and LDL oxidation by physiological antioxidants, polyphenols present in the oil.

*Trans fatty acids***.** Saturated fats from hydrogenated margarines are rich in atherogenic trans fats. They are a byproduct of partial hydrogenation of fats – a process that turns liquid fats into solid fats at room temperature by heating under pressure in the presence of nickel and hydrogen. They increase shelf-life and melting point, making them cheap alternatives to animal fats like butter and ghee. TFAs are found in vanaspatis, margarines and bread spreads.

Scientific studies report that dietary TFAs are associated with increased risk of CVD. In a Harvard Study in 1993 on 85,000 American nurses, those with highest intake of partially hydrogenated vegetable oils had 70% greater incidence of heart attacks.

Total TFA content in diet should not be more than 1% of the total calories. An 1% increase in TFA intake reduces HDL-C by 1% and increases LDL-C by 1%. It has also been reported that an intake of 2–3 g of TFAs increases the risk of CHD by 21% and an intake of more than 5 g increases the risk by 25%. TFAs also worsen insulin resistance, endothelial dysfunction and increase low-grade inflammation of blood vessels, which may cause atherosclerosis.

Sources of TFAs include the following:

- Foods from halwais, cheap eateries
- Indian snacks: fried namkeens, pakoras, samosa, kachori, paapri chaat, golgappas, tikki, fan
- Indian sweets: patisa, gulab jamun, jalebi, imarti
- Majority of Indian preparations at dhabas or restaurants: dal makhani, butter chicken, shahi paneer
- Commercially prepared foods: breakfast cereals, biscuits, cakes, cookies, pastries, doughnuts, pies, muffins, croissants, patties, baked products, chocolates, chips, crackers, fast foods, French fries, fried fish, instant noodles, dressings, snack puddings, microwave popcorns, breaded foods

*Monounsaturated fatty acids***.** It protects against CVD by reducing LDL-C and increasing HDL-C. These can be obtained from mustard, rice bran, sesame, rapeseed, groundnut and olive oil.

*Polyunsaturated fatty acids***.** Fats rich in PUFA include sunflower, safflower, corn and soybean. These have similar effects as MUFA on plasma lipid concentrations. However, excessive intake of PUFA that is more than 7% of total calories can be counterproductive.

Substantial evidence indicates that consumption of n-3 fatty acids from fish or fish oil supplements reduces adverse CVD outcomes and the risk of fatal heart attack, other heart diseases, hypertension and inflammatory conditions like rheumatoid arthritis. They are also known to reduce blood triglyceride levels, increase HDL-C and inhibit platelet aggregation.

Good sources of n-3 PUFA include bajra, urad dal, rajmah, lobia, soybeans, flax seeds, methi seeds, mustard seeds, sesame seeds, rice bran oil, mustard oil, soybean, green leafy vegetables, fish (Hilsa, Katla, Surmai, Black pomfret, Salmon) and fish oils*.

MUFA		EXCESSIVE PUFA (>7% total calories)
↓	Bad cholesterol	↓
↑	Good Cholesterol	↓
↓	Oxidation and rancidity	↑
	Suppresses immune system	↑
↓	Increases risk of gall stones	↑
	Possible promotion of tumors	↑
↓	Glucose intolerance	↑

Food-based guidelines to ensure optimal fat quality in Asian Indian diets:

- Best way to consume good fats is to consume them in their natural form as nuts and seeds.
- Since a complete dependence on just one vegetable oil does not ensure optimal intakes of various fatty acids, use of two or more vegetable oils is recommended. Good choice is a combination of mustard, rice bran, rapeseed (canola), sesame and olive oil.
- Butter and ghee (clarified butter), coconut oil, palm kernel oil, and palm oil can be taken in moderation as a part of a healthy diet. These oils are high in SFAs but they are TFA-free, if not processed.
- Use of hydrogenated vegetable oils like margarines and vanaspati for baking or cooking should be strictly avoided.
- Avoid high heat refined or reused oils.

Cholesterol

Cholesterol is found only in animal foods. Foods rich in cholesterol include organ meats, egg yolk, meat, fish, poultry and dairy products. According to the American Heart Association (AHA), a healthy diet should contain no more than 300 mg of cholesterol per day. Less than 200 mg per day is recommended for secondary prevention. However, among Indians being predominantly vegetarian, concerns regarding carbohydrates are more serious than cholesterol.

As a part of a healthy diet, egg cholesterol seems to have little impact on blood cholesterol levels. An egg nearly contains 215 mg cholesterol, surely a single yolk can make up for the entire day's limit of 300 mg cholesterol daily! However, studies have found no significant correlation between eggs and heart disease. Several studies have shown that regular egg consumption induces little or modest changes in blood cholesterol both in people with normal or high cholesterol levels. Recently, it was reported that people who consume one or more eggs a day are at no more risk of having heart disease than non-egg-eaters. According to Britain's Foods Standards Agency, there is no limit to eating eggs if they are part of a balanced diet. People with high blood cholesterol/heart disease should limit their egg intake to 3–4 eggs/week as a part of a healthy diet. For the normal population, an egg a day is safe.

Sodium

Excess salt can be harmful especially in high blood pressure. Salt requirements per day should be kept to one teaspoon (5 g)/day, which is equivalent to 2 g sodium/day.

Papads, pickles, chutneys, ajinomoto etc. are high in salt/sodium. Processed foods are a significant source of sodium and salt in our diets. Choose, where possible, products with less or no added salt. Fresh homemade pickles in vinegar or lemon juice, coriander, mint, tomatoes or garlic chutneys may be used instead.

While buying packaged foods, choose products with less than 120 mg/100 g of sodium. Avoid a product in which the first or the second ingredient is high in salt.

Tips to reduce sodium:

- Avoid commercially prepared foods
- Use high-sodium foods sparingly
- Reduce salt in cooking
- Restrict intake of fried namkeens, papads, commercially prepared soups and processed foods
- Choose fresh foods
- Perk up the taste of food by using lemon, pepper, herbs, spices, onion and garlic powder, powdered mustard, small amounts of sugar and finally chopped garlic
- Chinese food may contain large amounts of sodium in soy sauce and MSG
- Before using a salt substitute, consult your doctor

Antioxidants, functional foods and phytonutrients

Natural antioxidants that have been linked to heart health include beta-carotene, vitamin C, vitamin E, selenium and zinc. Eating foods rich in these vitamins and minerals is recommended over supplements.

Diet rich in nuts, seeds and whole grains is rich in vitamin E, zinc and selenium, while fresh fruits and vegetables are rich sources of beta-carotene and vitamin C. Six to nine servings of brightly colored fruits and vegetables (1/2 cup = 1 serving) have been reported to reduce risk of stroke by 59% than those who ate the least.

Functional foods provide special health benefits that go beyond their nutritional components like energy, vitamins, minerals, etc. These may include natural or formulated foods that enhance physiological performance or prevent diseases.

Functional foods include

- Turmeric, tulsi, neem, aloe-vera, fenugreek seeds, alfa-alfa
- Green tea, amla, soybean
- Yogurt (probiotics)
- Psyllum husk (prebiotics), oats, isabgol
- Brightly colored fruits and vegetables – berries, broccoli, tomatoes, citrus peel, GLVs, garlic, onion
- Beans and legumes
- Grapes, red wine
- Nuts and seeds – flaxseeds

Phytosterols are plant sterols or stanols similar to cholesterol that act in the intestines to lower cholesterol absorption. When esterified with fatty acids, they competitively inhibit the absorption of cholesterol, especially LDL and thus lower its level in plasma. Increasing the intake of phytosterols may be a practical way to reduce cholesterol levels. More than 40 types of phytosterols have been identified to have cholesterol-lowering properties.

Phytochemicals include phenols, chlorophyll, pheophytin, squalene, sterols and aroma components. They are most commonly found in fruits, vegetables including figs, avocados, nuts, oilseeds, oils such as rice bran, olive oil and whole grains including barley, oats and whole wheat.

When at least 1 g phytosterols per day are consumed in ester form, they help to reduce total cholesterol and LDL-C but do not affect HDL or triglycerides. Studies have revealed that phytochemicals at recommended intakes of about 2–2.5 g/d and products enriched with plant stanol/sterol esters are good for health as they lower plasma LDL-C by 10–14%. According to the AHA, a reduction in blood cholesterol can be achieved by consuming 1–3 g of plant sterols or stanols per day. These compounds effectively reduce LDL-C, both when taken as supplements or in natural foods. The National Cholesterol Education/Adult Treatment III program guidelines recommend plant sterols/plant stanols as part of a heart healthy eating plan.

Caffeine

While modest intake of caffeine may be protective, excess caffeine can be harmful by interfering with sleep, increasing water loss from the kidneys leading to dehydration, increasing arrhythmias and high blood pressure.

Unfiltered coffee can raise cholesterol by 9–14% if taken in excess. Cafestol and kahweol, compounds in boiled/steeped coffee, can boost cholesterol synthesis by the liver. These are found in highest concentrations in Scandinavian, Turkish coffees and French-press brews. Apparently, these compounds are trapped during filtration of coffee; that is why people who drink filtered coffee do not experience rise in blood cholesterol. Those with high cholesterol are advised to avoid boiled or steeped coffee and prefer drip or filtered coffee. It is better to limit coffee to two to three cups a day. Decaffeinated coffee reduces caffeine consumption. Other sources of caffeine include coffee, tea, colas and chocolates.

Alcohol

Light-to-moderate alcohol intake (one to two drinks per day) is associated with a decreased risk of death from heart risk by raising HDL-C. However, excess alcohol raises blood pressure, triglycerides, worsens insulin resistance and nullifies the benefits.

Alcohol may be classified as a food because it provides energy, one of the major functions of food. Alcohol contains about 7 calories/g, almost twice the value of an equal amount of carbohydrate or protein. Alcohol's value as a source of nutrients is virtually zero as it depletes the body of many precious nutrients including vitamin B_1, zinc and magnesium.

Occasional use of alcoholic beverages should be considered an addition to the regular meal plan, and no food should be omitted. The type of alcohol-containing beverage consumed does not appear to make a difference.

Alcohol intake should be limited to a moderate amount (one drink per day or less for women and two drinks per day or less for men). One alcohol-containing beverage is defined as 12 oz beer, 5 oz wine or 1.5 oz distilled spirits. Each contains about 15 g alcohol.

Five Recommendations to a Healthy Heart

1. Small frequent meals. A study published in the British Medical Journal reported that people who ate six small meals each day had an average cholesterol level 5% lower than those who ate only one or two big meals each day.
2. Avoid late night eating. Eat 3–4 hours before you go to bed.
3. Follow the principles of healthy eating.
    - Variety – eat a variety of foods to get all the vitamins and minerals you need.
    - Moderation – no food is good or bad, what matters is the portions that we consume.
    - Balance – in case of excesses, balance by eating less in the subsequent meal or with physical activity.
4. Regular physical activity. Aim for at least 30–45 minutes of physical activity on daily basis.
5. Choose a diet rich in fruits and vegetables, moderate in low-fat dairy, pulses, nuts, lean meat, fatty fish and cereals and limited in salt, sugar, caffeine and alcohol. Include functional foods, choose healthy fats and oils and avoid hydrogenated fats. Aim to achieve daily the following:
    - Vegetables (dark green leafy and brightly colored) – 3–5 servings (1 serving=1/2 cup cut)
    - Fruits – 2–3 servings (1 serving=1/2 cup cut; for watery fruits like melons, water melons and papaya 1 serving = 1 cup cut)
    - Low-fat dairy (milk, yogurt and cheese) – 2–3 servings (1 serving = 200 mL milk/200 mL yogurt/30 g cottage cheese)
    - Pulses and daals – 2 servings [1 serving = 1 katori pulse (30 g)/½ cup cooked beans]
    - Lean meat, fatty fish, poultry and eggs – 1–2 servings (1 serving = 100 g of lean meat, chicken or fish/2 eggs)
    - Cereals – 4–8 servings (50% whole grains), as per energy requirements [1 serving of grains/cereals = 1 bread slice/1 (medium) chapatti/1 idli/½ cup (cooked) rice/½ cup (cooked) pasta/½ cup (cooked) noodles]
    - Nuts and seeds – 1 serving (1 serving = handful = 20–25 g)
    - Plenty of fluids
    - Moderate fats and oils (3–6 teaspoons/d)
    - Moderate salt and alcohol
    - Limit caffeine intake
    - No hydrogenated fat