High cholesterol, Lipids and Heart Disease

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Part of the patient information booklet series by

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1. Why read this booklet?

Your doctor has told you that you have 'high cholesterol'. This booklet is aimed at explaining what high cholesterol is, and cover a number of aspects that links high cholesterol to heart disease. We aim to cover the following points:

- What is cholesterol?
- Why do I need cholesterol?
- What are the normal cholesterol levels?
- How is blood cholesterol measured?
- Why is a high cholesterol level harmful?
- How can I reduce my blood cholesterol level?

We hope you find the information below useful. Please do leave feedback on our website or write to us with your comments at www.baligadiagnostics.com.

2. Cholesterol and Blood Lipids – What Are They?

Blood lipids are a collective term which includes cholesterol and triglycerides, which are the fatty substances in the blood.

Cholesterol

Cholesterol is a fatty waxy substance that is made in the liver from saturated fats in food. Cholesterol in small amounts in the blood is good, and is required for the normal functioning of cells. It is transported in the blood along with certain proteins called 'lipoproteins'. There are two different kinds of lipoproteins that carry cholesterol:

1. Low density lipoproteins (LDL) – also called 'bad cholesterol'. This carries cholesterol from the liver to the cells. High levels of LDL can result in thickening of blood vessels and is a risk factor for developing a heart attack.

2. High density lipoproteins (HDL) – also called 'good cholesterol'. Its main role is the return the bad cholesterol through the blood stream back to the liver.

A lot of foods contain cholesterol, though they are mostly present in small amounts. Foods that contain high cholesterol include red meat (beef, pork, and lamb) and egg yolks. However, it is important to realise that not everything these foods are bad, and they contain nutrients that are essential to maintain healthy cells.

Triglycerides

These are again a 'bad' form of lipids, which are present in high concentrations in fried foods and dairy products. They are also produced in the body, mostly in the liver. High triglyceride levels are seen in people who are overweight and in those who consume large amounts of alcohol and fried foods.

3. Measuring Blood Cholesterol and Lipids

Cholesterol is measured as a part of assessing a patient's risk of developing heart disease and strokes.

Cholesterol and lipids concentrations in the blood are measured by a simple blood test. Ideally, these tests are performed early in the morning on an empty stomach, having observed an overnight fast (ideally 12 hours without food). Patients are allowed to drink clear fluids (water).

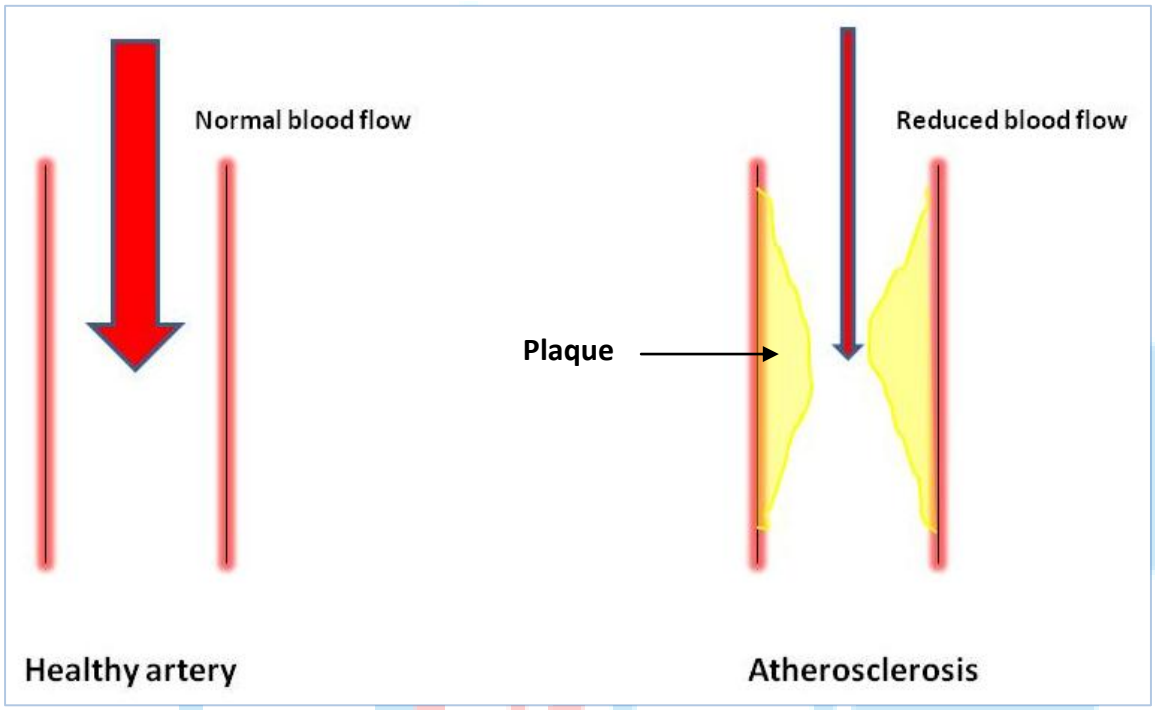
Cholesterol and triglycerides are measured in units called milligrams per decilitre. It is written as 'mg/dl'. The following values of cholesterol and triglyceride levels are considered acceptable:

- Total Cholesterol
  - **Normal is less than 200 mg/dl**
  - Borderline high is 200-239 mg/dl
  - High is more than 240 mg/dl
- HDL
  - **Levels more than 60 mg/dl do not need treatment**
  - Levels less than 40 mg/dl may need treatment
- LDL
  - **Levels more than 100 mg/dl need treatment**
  - Levels less than 90 mg/dl do not need treatment
- Triglycerides
  - **Normal is less than 150 mg/dl**
  - Borderline high is 150 to 199 mg/dl
  - High is 200-499 mg/dl
  - Very high is more than 500 mg/dl

These levels are considered by your doctor before treatment is prescribed. The type of treatment you will receive depends on which lipid level is high. Some doctors will consider taking a ratio of total cholesterol to HDL cholesterol, and may prescribe treatment if the ratio is more than 4.

4. High cholesterol and Atherosclerosis

When present in high levels in the blood, cholesterol and triglycerides can stick to the walls of the arteries causing them to thicken up due to formation of plaques (see diagram). This is called atherosclerosis. The coronary (heart) arteries are particularly vulnerable to this, especially if the patient is suffering from other risk factors such as high blood pressure and diabetes.

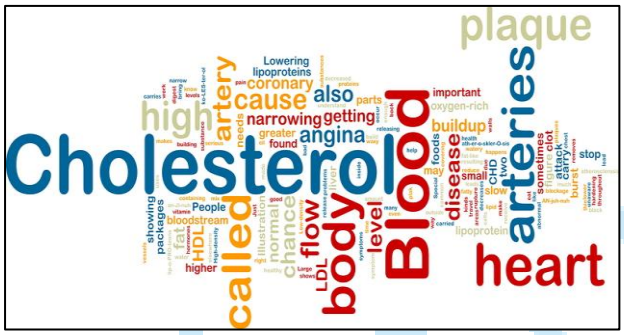


Thickening of the coronary arteries and other arteries over a period of time leads their narrowing. This narrowing can decrease the amount of blood reaching important tissues. When the coronary arteries are involved, significant atherosclerosis can cause heart attacks. When the blood vessels in the neck and brain are involved, it can cause strokes.

Cholesterol forms the main component of these plaques amongst others. By reducing the cholesterol levels in the blood, formation of these plaques and subsequent atherosclerosis can be reduced, thus reducing heart attacks and strokes.

5. High Cholesterol and Heart Attacks

As described in the chapter 4, atherosclerosis involving the coronary arteries can result in heart attacks. The plaques, which are also called



atheromas, develop when the level of the 'bad' LDL is too high in the blood. It is rare to get atheromas if the LDL is low and the HDL is high, as the 'good' HDL removes any excess cholesterol in the blood and thus prevents it from depositing on the arteries and thickening them.

In order to prevent heart disease from atherosclerosis, you doctor will aim for the following:

- A low total cholesterol level
- A low LDL (bad cholesterol) level
- A high HDL (good cholesterol) level

Having high cholesterol is of more concern to your doctor especially if there are additional risk factors that can lead to heart disease. These include

- High blood pressure
- Diabetes
- Smoking
- High alcohol intake
- Being overweight
- Having a strong family history of heart disease (under 55 years for women and 65 years for men)
- Interestingly, people in South Asia (of Indian, Pakistani, Nepalese, Bangladeshi and Sri Lankan origin) are more prone to developing heart disease when compared to the western world.

Most patients who suffer from heart disease often have a combination of these factors. Targeting them individually with medication and other measures is an important strategy to help treat them.

6. What Causes High Blood Cholesterol?

The commonest cause of developing high cholesterol is a high intake of fatty foods, especially those that are high in saturated fats. However, in some cases, high cholesterol levels in the blood runs in the family, and may not be related to diet.

There are a number of other factors that can result in high cholesterol levels, which have been summarised in the table below

- Diet high in oil/fat content (fried foods, sweets, red meat)
- Familial (runs in the family)
- Underactive thyroid gland (hypothyroidism)
- Long term kidney problems
- High alcohol consumption

Familial hypercholesterolemia

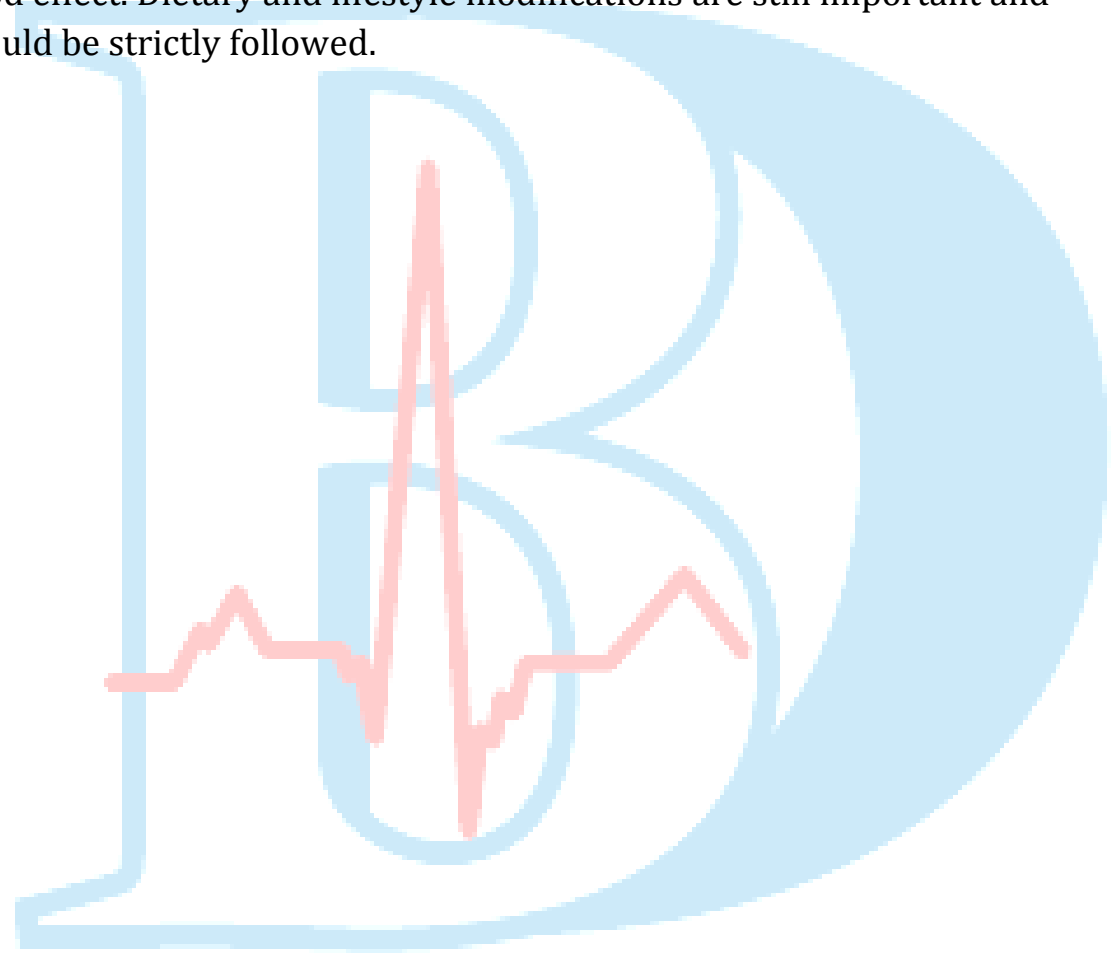
In some patients, a condition called Familial hypercholesterolemia exists. Familial hypercholesterolemia is a clinical condition where a number of different family members through generations suffer from high cholesterol levels in the blood. The reason why this occurs is because the body's inbuilt mechanism of getting rid of high cholesterol levels is faulty.

Patients who suffer from familial hypercholesterolemia are at a higher risk of developing heart attacks and chest pains. Unlike most patients who suffer from these conditions as they get older, patients who have familial hypercholesterolemia often develop heart problems at a younger age. From a scientific and genetic point of view, this condition is passed on in an autosomal dominant fashion. This means that as a patient, there is a 50% chance that your child will also develop this condition.

In patients who have familial hypercholesterolemia, there may be certain signs and symptoms that can be indicative of this condition. For example, patients may notice tiny skin lumps on their tendons around the knuckles

and behind the ankle tendon (Achilles tendon). In most cases they do not cause any pain but sometimes patients may find it slightly tender. In the long run, patients can develop heart disease and stroke, especially if they do not commence medical therapy soon.

It is possible to screen patients who have a strong family history of high cholesterol by performing certain simple blood tests. However, if the patient does suffer from very high cholesterol levels, treatments that have been described above (in previous chapters) can be administered with good effect. Dietary and lifestyle modifications are still important and should be strictly followed.



7. Can Exercise Reduce Cholesterol Levels?

A number of studies conducted all over the world have shown that exercise reduces cholesterol levels in the blood. Regular activity, such as brisk walking or jogging everyday has been shown to keep the cholesterol levels down. Furthermore, it has also been shown to improve the levels of the good HDL in the blood.

In addition to reducing blood cholesterol levels, exercise helps maintain a healthy blood pressure and heart rate. It also reduces the risk of developing diabetes.

It is important to note that just going for a short stroll in the evening or doing a bit of gardening does not constitute exercise that will help as described above. It is essential that the exercise you perform leaves you sufficiently tired and slightly out of breath. We do not recommend starting off with a 'hardcore' exercise plan from day 1, but building it up gradually over a period of time. Your doctor will advise you as to what you can and cannot do.

Some of the activities we recommend are as follows:

- Brisk walking for 30 minutes
- Gentle jog for 30 minutes
- Using the stairs instead of the lift
- Walking to work instead of taking the bus or driving (provided it's not too far!!).

For further information, do refer to our information leaflets titled 'Exercise and the heart'.

8. Healthy Eating and Cholesterol Levels

Eating healthy is an age old piece of advice that doctors have given patients with almost any ailment. Studies have shown that following a strict and healthy diet plan can reduce blood cholesterol.

Almost every food that we consume contains fats. These can be either mono-unsaturated or poly-unsaturated (good) fats or saturated (bad) fats. In order to maintain a healthy cholesterol level, the following should be observed:

- A diet low in saturated fats
- Reduce the total amount of fat you consume. For example, reduce the amount of fried foods, sweets, ice cream, crisps, biscuits and red meat you eat. Instead replace this with a healthy salad or a piece of fruit.
- Eat more starchy carbohydrates like brown rice and brown bread. These will keep you fuller for longer and will help prevent from snacking on fried nibbles.
- Eat oily fish such as mackerel and sardines. These are high in mono and poly unsaturated fats as opposed to saturates, and are also high in omega-3 fats which are very good for you. We recommend baking or grilling the fish rather than frying them in oil.

Foods containing fats

- Rich in mono-unsaturated fats
    - Oils – Olive oil, rapeseed oil
    - Nuts – Peanuts, cashew nuts, almonds
- Poly-unsaturated fats
    - Oils – Sunflower oil, corn oil
    - Nuts – Walnuts
- Omega – 3 fats
    - Fish – Mackerel, sardines
    - Cod liver oil
- Saturated fats (bad)
    - Dairy products - Butter, cheese, ghee, cream
    - Oils – Coconut oil, palm oil

- Red meat, liver
- Savoury items – biscuits, cakes, sweets

Trans-fats are a form of saturated fats that are present in cakes, biscuits and pastries, and should be avoided. A lot of products available in supermarket these days do advertise the lack of trans-fats in them.

Omega – 3 fats

These are a good form of fats that are present in high quantities in oily fish and certain seeds. They have been shown to reduce triglyceride levels in the blood. Studies have been conducted for years into their health benefits, and the overall opinion to date is that these fats are good for you. Non-vegetarians can obtain omega - 3 fats by eating fish like sardines and mackerel, which contain this in high amounts. Unfortunately, there are not many vegetarian sources available, though flaxseeds (linseed) and walnuts have good quantities of it. Omega-3 supplements are now available at your local pharmacy.

So what dietary measures should I follow to keep my cholesterol low?

There are a number of ways to keep your cholesterol levels low.

1. *Eat a high fibre diet* – Foods that are rich in fibre such as green vegetables, brown rice and brown bread, bran flakes, pulses, lentils, ragi, spinach etc are high in fibre and help lower cholesterol. Furthermore, these foods keep you fuller longer, so help you avoid frequent snacking.

2. *Eat more fruit and vegetables* – This could include fresh and frozen produce.

3. *Avoid foods high in cholesterol* – This includes whole eggs, prawns, red meat and a variety of fried foods and snacks. Keep intake of saturated fats low.

9. Do I Need Tablets Doctor?

Once you have been diagnosed with having high cholesterol, your doctor will assess your risk of having a heart attack or stroke, and will accordingly inform you whether you need to start tablets. Furthermore, this also depends on which form of cholesterol (good or bad) is high as well.

In patients who have a number of risk factors for developing heart disease, or in those who have already been diagnosed with heart disease, your doctor will strongly consider commencing treatment. A few of the factors which are kept in mind are:

- Does the patient have diabetes?
- Is the patient male or female?
- Does the patient smoke or have high blood pressure?
- Has the patient had a heart attack or stroke in the past?
- Has the patient had a heart bypass operation or angioplasty before?

However, the presence of the above is not essential, and doctors may also start patients on treatment if they have many risk factors for developing heart disease, such as a history of smoking, high blood pressure or a family history of heart problems.

The type of drug the doctor will prescribe usually depends on the type of cholesterol that needs treating, and also on experience. Of course, there will be times when it will be advised that dietary modifications would be sufficient, and if this fails, then tablets will be prescribed.

10. Medicines for High Cholesterol

Cholesterol lowering drugs are being used more and more these days as the scientific evidence supporting their use is strong. Treatment is life-long, and though very effective, need to be accompanied by lifestyle modifications such as dietary changes, stopping smoking and getting plenty of exercise.

Statins

These drugs are the most commonly used and prescribed cholesterol drugs on the market. The commonly used ones are Simvastatin, Atorvastatin, Pravastatin, Fluvastatin and Rosuvastatin.

Statins are unique in their mode of action, as they block a crucial enzyme in the liver that is involved in the synthesis of cholesterol. By doing so, they reduce levels of bad cholesterol (LDL) in the blood. They also possess a number of other properties that reduce inflammation and formation of atheromas in the arteries, thus reducing the risk of developing a heart attack or stroke.

The most commonly used statin by doctors is Simvastatin, though you may be prescribed other statins. Most statins are advised to be taken in the evening or at bedtime, as they work their best at that time. Atorvastatin and Rosuvastatin can be taken at any time.

Statins are not suitable for patients with liver disease or in pregnancy and while breastfeeding. Patients on simvastatin should avoid drinking grapefruit juice (or eating grapefruits), though patients on other statins can have small amounts of it.

Side effects of statins include mild headaches, feeling sick and diarrhoea. Rarer side effects include inflammation and pain in the muscles (called myositis). If this occurs, please inform your doctor who will either stop the treatment or change it to another drug.

Niacin

Niacin, also called nicotinic acid, is a form of Vitamin B (vitamin B3). It is useful in reducing cholesterol and triglycerides. In particular, it reduces VLDL and LDL levels. It is also very effective in increasing HDL. It is commonly prescribed with bile acid binding resins.

Common side effects include a feeling of warmth under the skin, which occurs due to dilatation of blood vessels. This usually wears off with continued use of the drug. Sometimes, aspirin is prescribed to take half an hour before taking niacin.

Fibrates

Fibrates are a class of drugs that reduce both blood cholesterol and triglyceride levels. They are rarely given to patients who take statins as well. The commonly used fibrates are bezafibrate, clofibrate, fenofibrate and gemfibrozil.

Fibrates are useful in reducing VLDL and LDL. Side effects are rare, but include a mild skin rash, stomach upset, muscle aches and irregular heartbeats. They should be avoided in pregnancy, and in liver and kidney disease.

Bile acid binding resins

This group of drugs include cholestyramine and colestipol. They act by binding bile acids, which are breakdown products of cholesterol. Normally, bile acids once formed get re-absorbed in the small intestine. By binding to bile acids, these drugs reduce the absorption of cholesterol into the blood stream, and thus reduce blood cholesterol levels.

Bile acids are available as granules, and require rehydration prior to use. Either fruit juice or water can be used. They are of no use in between meals, so have to be taken 2-3 times daily *with* food.

Common side effects of use include abdominal bloating and constipation. High dietary fibre can be helpful in such situations. As the drug is not absorbed, it is not harmful in pregnancy. Some patients can have heartburn and dry skin, which is easily dealt with moisturisers.

Ezetimibe

This is a drug that reduces cholesterol by preventing it from being absorbed from the small intestine. It reduces LDL, and is commonly given with statins, though it can also be given on its own.

It is available in tablet form, and is usually given twice a day.

Common side effects include abdominal pain, diarrhoea and headaches.

Using medication to manage high cholesterol levels

Most patients who suffer from high cholesterol may not necessarily need a combination of treatments. Statins are often sufficient and help bring down the LDL cholesterol safely and effectively. However, on certain occasions, patients may also have elevated triglyceride levels in addition to high cholesterol levels. In such a situation, combination treatments may be required to bring these levels down.

11. Conclusion

Are high cholesterol level bears a direct relationship to the future development of atherosclerosis and coronary artery disease. There can be a number of different causes for high cholesterol but the bottom line remains that bad cholesterol can result in heart attacks while good cholesterol can help protect the heart. High cholesterol levels can also run in families and can increase the risk of developing heart disease.

Treatments are numerous and are safe and effective as long as they are taken regularly. Diet and exercise also form an important part of managing patients with high cholesterol. By adopting these measures, patients with high cholesterol can reduce the risk of developing strokes and heart disease in the future.

For further information or to book a blood test to evaluate your cholesterol levels, visit our website at www.baligadiagnostics.com.