Hyperlipidemia, hyperlipoproteinemia, or hyperlipidaemia (British English) involves abnormally elevated levels of any or all lipids and/or lipoproteins in the blood. It is the most common form of dyslipidemia (which includes any abnormal lipid levels).

Lipids (fat-soluble molecules) are transported in a protein capsule. The size of that capsule, or lipoprotein, determines its density. The lipoprotein density and type of apolipoproteins it contains determines the fate of the particle and its influence on metabolism.

Hyperlipidemias are divided into primary and secondary subtypes. Primary hyperlipidemia is usually due to genetic causes (such as a mutation in a receptor protein), while secondary hyperlipidemia arises due to other underlying causes such as diabetes. Lipid and lipoprotein abnormalities are common in the general population, and are regarded as a modifiable risk factor for cardiovascular disease due to their influence on atherosclerosis. In addition, some forms may predispose to acute pancreatitis.

Classification

Hyperlipidemias may basically be classified as either familial (also called primary) caused by specific genetic abnormalities, or acquired (also called secondary) when resulting from another underlying disorder that leads to alterations in plasma lipid and lipoprotein metabolism. Also, hyperlipidemia may be idiopathic, that is, without known cause.

Hyperlipidemias are also classified according to which types of lipids are elevated, that is hypercholesterolemia, hypertriglyceridemia or both in combined hyperlipidemia. Elevated levels of Lipoprotein(a) may also be classified as a form of hyperlipidemia.

Familial (primary)

Familial hyperlipidemias are classified according to the Fredrickson classification, which is based on the pattern of lipoproteins on electrophoresis or ultracentrifugation. It was later adopted by the World Health Organization (WHO). It does not directly account for HDL, and it does not distinguish among the different genes that may be partially responsible for some of these conditions.
Relative prevalence of familial forms of hyperlipoproteinemia

**Hyperlipoproteinemia type I**

Type I hyperlipoproteinemia exists in several forms:

- Lipoprotein lipase deficiency (type Ia), due to a deficiency of lipoprotein lipase (LPL) or altered apolipoprotein C2, resulting in elevated chylomicrons, the particles that transfer fatty acids from the digestive tract to the liver.
- Familial apoprotein CII deficiency (type Ib), a condition caused by a lack of lipoprotein lipase activator.\(^{533}\)
- Chylomicronemia due to circulating inhibitor of lipoprotein lipase (type Ic)

Type I hyperlipoproteinemia usually presents in childhood with eruptive xanthomata and abdominal colic. Complications include retinal vein occlusion, acute pancreatitis, steatosis and organomegaly, and lipaemia retinalis.

**Hyperlipoproteinemia type II**

Hyperlipoproteinemia type II, by far the most common form, is further classified into types IIa and IIb, depending mainly on whether elevation in the triglyceride level occurs in addition to LDL cholesterol.

**Type IIa**

Main article: Familial hypercholesterolemia

This may be sporadic (due to dietary factors), polygenic, or truly familial as a result of a mutation either in the LDL receptor gene on chromosome 19 (0.2% of the population) or the ApoB gene (0.2%). The familial form is characterized by tendon xanthoma, xanthelasma, and premature cardiovascular disease. The incidence of this disease is about one in 500 for heterozygotes, and one in 1,000,000 for homozygotes.

**Acquired (secondary)**[edit]

Acquired hyperlipidemias (also called secondary dyslipoproteinemias) often mimic primary forms of hyperlipidemia and can have similar consequences.\(^{21}\) They may result in increased risk of premature atherosclerosis or, when associated with marked hypertriglyceridemia, may lead to pancreatitis and other
complications of the chylomicronemia syndrome. The most common causes of acquired hyperlipidemia are:

- **diabetes mellitus**
- Use of drugs such as diuretics, beta blockers, and estrogens

Other conditions leading to acquired hyperlipidemia include:

- Hypothyroidism
- Renal failure
- Nephrotic syndrome
- Alcohol consumption
- Some rare endocrine disorders and metabolic disorders

Treatment of the underlying condition, when possible, or discontinuation of the offending drugs usually leads to an improvement in the hyperlipidemia. Specific lipid-lowering therapy may be required in certain circumstances.

Another acquired cause of hyperlipidemia, although not always included in this category, is postprandial hyperlipidemia, a normal increase following ingestion of food.

**Management**

For treatment of type II, dietary modification is the initial approach, but many patients require treatment with statins (HMG-CoA reductase inhibitors) to reduce cardiovascular risk. If the triglyceride level is markedly raised, fibrates may be preferable due to their beneficial effects. Combination treatment of statins and fibrates, while highly effective, causes a markedly increased risk of myopathy and rhabdomyolysis, so is only done under close supervision. Other agents commonly added to statins are ezetimibe, niacin, and bile acid sequestrants. Dietary supplementation with fish oil is also used to reduce elevated triglycerides, with the greatest effect occurring in patients with the greatest severity. Some evidence exists for benefit of plant sterol-containing products and omega-3 fatty acids.

A drug may be classified by the chemical type of the active ingredient or by the way it is used to treat a particular condition. Each drug can be classified into one or more drug classes.

Antihyperlipidemic agents promote reduction of lipid levels in the blood. Some antihyperlipidemic agents aim to lower the levels of low-density lipoprotein (LDL) cholesterol, some reduce triglyceride levels, and some help raise the high-density lipoprotein (HDL) cholesterol. By reducing the LDL cholesterol,
they can prevent both the primary and secondary symptoms of coronary heart
disease.

Niacin and ezetimibe are available in combination with statins, as single dose
forms. Antihyperlipidemic agents are also available in combinations with
antihypertensive agents. By having one pill with a couple of agents makes it
easier to take and increases compliance.

A drug may be classified by the chemical type of the active ingredient or by the
way it is used to treat a particular condition. Each drug can be classified into
one or more drug classes.

**Bile acid sequestrants are used to reduce low density lipoprotein (LDL)
cholesterol levels.** After oral administration, they are not absorbed but bind to
bile acids (which contains cholesterol) in the intestine and prevent their
reabsorption into the body. The bound complex is insoluble and is excreted in
the faeces. Decrease in bile acid leads to an increase in hepatic synthesis of bile
acids from cholesterol. Depletion of cholesterol increases LDL receptor activity,
therefore increases removal of LDL cholesterol from the blood.

A drug may be classified by the chemical type of the active ingredient or by the
way it is used to treat a particular condition. Each drug can be classified into
one or more drug classes.

**Cholesterol absorption inhibitors reduce the absorption of dietary and biliary
cholesterol through the intestines.** Therefore it decreases the amount of intestinal
cholesterol that is delivered to the liver. Reduced levels of cholesterol delivered
to the liver results in increased hepatic LDL (low density lipoprotein) receptor
activity, which leads to increased clearance of LDL cholesterol.

Cholesterol absorption inhibitors are used to treat hyperlipidemia, by lowering
LDL cholesterol and total cholesterol

**Fibrin acid derivatives or fibrates** are regarded as broad-spectrum lipid lowering
drugs. Their main action is to decrease triglyceride levels but they also tend to
reduce low density lipoprotein (LDL) cholesterol levels and help to raise high
density lipoprotein (HDL) cholesterol. Fibrates appear to activate a protein
called peroxisome proliferator-activated receptor alpha (PPAR-alpha). PPAR-
alpha activates the enzyme lipoprotein lipase and ultimately results in decreased
formation of very low-density lipoprotein (VLDL) cholesterol (which is
converted into LDL cholesterol) and triglycerides and an increase in HDL
cholesterol.

Miscellaneous antihyperlipidemic agents are used to treat hyperlipidemia. They
help to decrease total cholesterol by lowering low-density lipoprotein (LDL)
cholesterol and triglycerides and raising high-density lipoproteins (HDL)
cholesterol. Niacin (nicotinic acid) is a water-soluble B vitamin, which inhibits the synthesis of cholesterol and triglycerides, therefore lowers total cholesterol and triglyceride levels, and raises HDL cholesterol levels.

Statins, also known as HMG-CoA reductase inhibitors, inhibit HMG-CoA reductase (3-hydroxy-3-methylglutaryl coenzyme A reductase) an enzyme involved in the synthesis of cholesterol especially in the liver. Decreased cholesterol production leads to an increase in the number of LDL (low density lipoprotein) membrane receptors, which increases clearance of LDL cholesterol from circulation.

Statins are used to treat hyperlipidemia and are the most effective drugs in lowering LDL cholesterol.