HYPERLIPIDEMIA

*High Cholesterol, Hlp*

Abnormally elevated levels of any or all lipids in the blood.

**Diagnosis**

- Male & Female

**Related Diagnoses:**

- Polycystic ovary syndrome

About Hyperlipidemia

Hyperlipidemia is a disorder of lipid metabolism manifested by elevation of plasma concentration of the various lipids and lipoproteins fraction, which is the key risk factor for all the life-threatening diseases like cardiovascular disease, diabetes, hypertension (high blood pressure) etc.

The main biological functions of lipids include storing energy, signaling, and acting as structural components of cell membranes.

Lipids are transported in a protein capsule. The size of that capsule, called lipoprotein, determines its density (its mass per unit volume, Pic. 1).

The main measurable lipids (Pic. 2) in medical practice are:

- **LDL cholesterol** - which is a "bad" cholesterol that builds up inside arteries
- **HDL cholesterol** - which is the "good" cholesterol that lowers risk for heart disease
- **Triglycerides**
- **Total cholesterol** - which is a combination of the other three numbers

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. Depending on the basis of lipid type hyperlipidemia may be classified as hypercholesterolemia (the level of cholesterol is elevated) and hypertriglycerolemia (an elevated of triglycerides) (Pic. 3). Also, hyperlipidemia may be idiopathic, that is, without a known cause.

**Familial (primary) hyperlipidemia**

Familial hyperlipidemia is classified into five types (Pic. 4) on the basis of electrophoresis or
ultracentrifugation pattern of lipoproteins.

**Acquired (secondary) hyperlipidemia**

Acquired hyperlipidemias (Pic. 5) may result in increased risk of premature atherosclerosis or, when associated with marked hypertriglyceridemia, may lead to pancreatitis (inflammation in the pancreas).

**The most common causes of acquired hyperlipidemia are:**

- diabetes mellitus
- use of drugs such as diuretics (any substance that promotes increased production of urine), beta blockers (a class of medications that are particularly used to manage cardiac arrhythmias), and estrogens (the primary female sex hormone)

**Other conditions leading to acquired hyperlipidemia include:**

- hypothyroidism (a common disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormone)
- kidney failure (a medical condition of impaired kidney function in which the kidneys fail to adequately filter metabolic wastes from the blood)
- nephrotic syndrome (a group of symptoms that include protein in the urine, low blood protein levels in the blood, high cholesterol levels, high triglyceride levels, and swelling)
- alcohol consumption
- some rare endocrine disorders and metabolic disorders

Diagnosis of these condition is done with laboratory tests. The patients have to fast for at least 12 hours before taking the blood sample. The laboratory test focuses on the lipid profile i.e., measure lipid profile which include total plasma cholesterol, HDL, LDL, VLDL and triglycerides levels.

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.

**Associated diseases**

Hyperlipidemia is a well-known risk factor for vascular diseases such as stroke (occurs when the blood supply to part of the brain is cut off) and myocardial infarction. Long term expose to the risk factors promotes atherosclerosis and subsequently develops stroke.

Some forms may predispose to acute pankreatitis (an inflammatory condition of the pancreas that is painful and at times deadly).

**Complications**

Complications include retinal vein occlusion (a blockage of blood flow, causing blurring or loss of vision), acute pancreatitis, steatosis (the process describing the abnormal retention of lipids within a cell), and organomegaly (enlargement of organs), and lipemia retinalis (a rare condition characterized by creamy, white colored vessels of retina).

**Risk factors**
- gender - after menopause, a woman's cholesterol LDL is increased
- age - men after 45 and women after 55 are at higher risk of hyperlipidemia
- family history - if any of parents was affected
- diet - fat, sugar and high cholesterol in food raise the LDL cholesterol
- weight - being overweight can make LDL cholesterol level go up
- physical activity - physical activity can decrease the level of LDL cholesterol, and raise HDL cholesterol

**Impact on fertility**

Cholesterol is necessary for sperm function. It is crucial for gametogenesis (the production of sperm- spermatogenesis and eggs- oogenesis), also for post-testicular sperm maturation (the process in which sperms are produced from stem cells). In process of maturation cholesterol changes proteins in membrane which leads to changes in membrane composition. It is necessary for membrane fluidity during epididymal transit.

Cholesterol also have a role in process of capacitation (a biochemical event which is required to render them competent to fertilize an oocyte) and acrosome reaction (a sperm must first fuse with the plasma membrane and then penetrate the female egg in order to fertilize it). All these processes are necessary for fertilization of female egg.

Women with familial hypercholesterolemia who are planning to become pregnant should be advised to stop use statins (a class of lipid-lowering medications) 3 month prior to attempting to concieve. Statins may be potential risk and can lead to fetal abnormality. If women became pregnant and the baby is conceived while taking statins or other lipid-modifying drugs, she should be advised to stop treatment immediately and be referred to an obstetrician for fetal assessment. Cholesterol concentration naturally increases during pregnancy but lipid-modifying medication is contraindicated in any case.

**Prevention**

**Diet**

The behavior change of reducing intake of animal fat is observed. It is important that dietary treatment of hyperlipidemia focuses not only on correcting serum lipid levels but also on preventing arteriosclerotic diseases.

**Family support**

It has been reported that family members recommending behavior change acts as motivation. Thus, when implementing intervention, support from spouses and family members who prepare meals is necessary.

**Physical activity**

Physical activity results in decreased triglycerides and increased HDL-cholesterol. Because increase in physical activity lead to restricted total energy intake, it probably result in improvement of lipid abnormalities.
Symptoms

- xanthomata (a deposition of yellowish cholesterol-rich material that can appear anywhere in the body, Pic. 6)
- abdominal colic
- arcus juvenilis (blue opaque ring in the corneal margin, Pic. 7)
- arterial bruits
- claudication (impairment in walking, or pain, discomfort, numbness, or tiredness in the legs that occurs during walking or standing and is relieved by rest)
- xanthomata on hands
- orange discoloration of skin creases
- xanthomata on the elbows and knees
- glucose intolerance
- hyperuricemia (an abnormally high level of uric acid in the blood)

Therapies

Self therapy

Since synthetic drugs have been shown to have side effect, clinical importance of herbal drugs in the treatment of Hyperlipidemia has receive considerable attention in recent years.

For the low cost, effectiveness, and fewer side effects, the popularity of using traditional Chinese medicine (TCM) to handle hyperlipidemia is increasing and its role in health care has been recognized by the public at large. Despite the importance of TCM herbs and formulations, there is no comprehensive review summarizing their scientific findings on handling hyperlipidemia.

Ayurveda medicine, is a system of medicine with historical roots in the Indian subcontinent. Globalized and modernized practices derived from Ayurveda traditions are a type of complementary or alternative medicine. The drug Eranda (Ricinus communis) and Hingu (Ferula narthex) are used as antihyperlipidemic drugs and i.e. medoharadravya as per Ayurvedic literature.

Hyperlipidemic patients should be warned about the potential risks of herb-drug interactions, particularly those taking anticoagulants and antiplatelet drugs.

Conventional medicine

Conventional medicine include two main categories- pharmacotherapy and surgical therapy. In case of hyperlipidemia, only pharmacotherapy can help patient with the disease. Two main types of drugs are used- statins and fibrates and in special occasions, they can be combined.

Pharmacotherapy

For treatment of type II, dietary modification is the initial approach, but many
patients require treatment with statins 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 (a disease of muscle in which the muscle fibers do not function properly) and rhabdomyolysis (a condition in which damaged skeletal muscle breaks down rapidly), so is only done under close supervision.

**Surgical therapy**

There is no surgical therapy for this condition.

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**Assisted reproduction**

In case of familial hypercholesterolemia, almost all individual have an affected parent. In very rare cases FH is caused by a de novo (an alteration in a gene that is present for the first time in one family member) pathogenic variant. Each child of an individual with FH has a 50% chance of inheriting the disease.

The PGD allows studying the DNA of eggs or embryos to select those that carry certain damaging characteristics. It is useful when there are previous chromosomal or genetic disorders in the family, within the context of in vitro fertilization programs.

IVF and ART generally start with stimulating the ovaries to increase egg production. Most fertility medications are agents that stimulate the development of follicles in the ovary. Examples are gonadotropins and gonadotropin releasing hormone.

After stimulation, the physician surgically extracts one or more eggs from the ovary, and unites them with sperm in a laboratory setting, with the intent of producing one or more embryos. Fertilization takes place outside the body, and the fertilized egg is reinserted into the woman's reproductive tract, in a procedure called embryo transfer.

If the pathogenic variant of a family member with FH has been indentified, prenatal testing can help to choose the embryo without this kind of mutation.

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**Find more about related issues**

**Diagnoses**

*Polycystic ovary syndrome*
A condition in which a woman has an imbalance of female sex hormones. This may lead to changes in the menstrual cycle, cysts in the ovaries, trouble g
Learn more at: [www.fertilitypedia.org/therapy/diag/polycystic-ovary-syndrome](http://www.fertilitypedia.org/therapy/diag/polycystic-ovary-syndrome)

**Therapies**
**Egg donation**
Process by which a woman donates eggs for purposes of assisted reproduction or biomedical research.
Learn more at: [www.fertilitypedia.org/edu/therapies/egg-donation](http://www.fertilitypedia.org/edu/therapies/egg-donation)

**ICSI**
A micromanipulative fertilization technique in which a single sperm is injected directly into an egg.
Learn more at: [www.fertilitypedia.org/edu/therapies/icsi](http://www.fertilitypedia.org/edu/therapies/icsi)

**Sperm donation**
The procedure in which a man (sperm donor) provides his sperm for fertility treatment.
Learn more at: [www.fertilitypedia.org/edu/therapies/sperm-donation](http://www.fertilitypedia.org/edu/therapies/sperm-donation)

**Standard IVF**
A process in which an egg is fertilised by sperm outside the body: in vitro. Own or donated gametes may be used.
Learn more at: [www.fertilitypedia.org/edu/therapies/standard-ivf](http://www.fertilitypedia.org/edu/therapies/standard-ivf)

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### Pic Characteristics of major lipoprotein classes.

<table>
<thead>
<tr>
<th>Lipoprotein class</th>
<th>Density (g/mL)</th>
<th>Diameter (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chol. Lp.</td>
<td>1.006-1.063</td>
<td>2.1-2.5</td>
</tr>
<tr>
<td>HDL</td>
<td>1.019-1.063</td>
<td>2.1-2.5</td>
</tr>
<tr>
<td>LDL</td>
<td>1.063-1.006</td>
<td>&lt;2.1</td>
</tr>
<tr>
<td>VLDL</td>
<td>&gt;1.006</td>
<td>&gt;2.5</td>
</tr>
</tbody>
</table>

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### Pic Normal levels for a lipid profile.

<table>
<thead>
<tr>
<th>Lipid</th>
<th>Reference values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cholesterol</td>
<td>160-240 mg/dL</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>40-150 mg/dL</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>&lt;100 mg/dL</td>
</tr>
<tr>
<td>VLDL cholesterol</td>
<td>&lt;35 mg/dL</td>
</tr>
</tbody>
</table>

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### Pic Cathegories depending on the basis of causing factor.

- Type I: Familial hypercholesterolemia
- Type II: Familial hypertriglyceridemia
- Type III: Familial combined hyperlipidemia
- Type IV: Familial hypertriglyceridemia
- Type V: Familial hyperlipoproteinemia

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### Pic A table of classification of primary hyperlipidemia with their characteristics.

<table>
<thead>
<tr>
<th>Lipoprotein class</th>
<th>Defect</th>
<th>Increased lipoprotein</th>
<th>Symptoms</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Familial hypercholesterolemia</td>
<td>Increased Lp. cholesterol</td>
<td>Xanthomas, xanthelasma, xanthoelasmata, xanthodermites</td>
<td>Diet control</td>
</tr>
<tr>
<td>Type II</td>
<td>Familial hypertriglyceridemia</td>
<td>Increased Lp. triglycerides</td>
<td>Xanthomas, xanthelasma, xanthoelasmata, xanthodermites</td>
<td>Diet control</td>
</tr>
<tr>
<td>Type III</td>
<td>Familial combined hyperlipidemia</td>
<td>Increased Lp. cholesterol and triglycerides</td>
<td>Xanthomas, xanthelasma, xanthoelasmata, xanthodermites</td>
<td>Diet control</td>
</tr>
<tr>
<td>Type IV</td>
<td>Familial hypertriglyceridemia</td>
<td>Increased Lp. triglycerides</td>
<td>Xanthomas, xanthelasma, xanthoelasmata, xanthodermites</td>
<td>Diet control</td>
</tr>
<tr>
<td>Type V</td>
<td>Familial hyperlipoproteinemia</td>
<td>Increased Lp. cholesterol and triglycerides</td>
<td>Xanthomas, xanthelasma, xanthoelasmata, xanthodermites</td>
<td>Diet control</td>
</tr>
</tbody>
</table>

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### Pic Photograph of patient's knee showing multiple xanthoma.
Four representative slides of corneal arcus. Arcus deposits tend to start at 6 and 12 o’clock and fill in until becoming completely circumferential.

Sources

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