

Review Article on Hyperlipidemia.

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ABSTRACT: When an individual carrying excess lipid contained in body, the condition is coined as hyperlipidemia. A person is considered hyperlipidemic if they have excess weight along with high cholesterol levels. The way of life we are habituated to including very less physical activities, Life style has become easy with minimal number of physical movements. Lower the exercise and physical activities more is the risk of dyslipidaemia disease. Hyperlipidemia is one of the risk factors for developing several diseases including, hypertension, cardiovascular disease, stroke, sleep apnoea. Hyperlipidemia is the underlying cause of cardiovascular diseases, CHDs and atherosclerosis. Antihyperlipidemic agents have significant potential to retard the process of atherosclerosis therefore they have been increasingly used as prophylactic in above disorders associated with hyperlipidemia. The present review focuses mainly on the types of hyperlipidemias, lipid metabolism, treatments

KEYWORDS: Hyperlipidemia, cholesterol, cardiovascular disease.

I. INTRODUCTION

Modern culture, in the name of westernization, has changed our life style which in turn has changed our food habits and health care. This has lead to an increased incidence of various disorders like diabetes, hypertension and hyperlipidemia. Hyperlipidemia is a heterogenous group of disorders characterized by abnormal elevated levels of any or all lipids and/ or lipoproteins in the blood. It is also known as hyperlipoproteinemia and is considered as a key risk factor for cardio vascular disorders (CVD)^[1]. The causes of hyperlipidemia are mainly life style changes (poor diet, smoking, alcohol). The hyperlipidemia may be primary ie. Genetic (monogenic, polygenic) or secondary which is associated with diabetes, myxedema, nephrotic syndrome, chronic alcoholism, drugs (corticosteroids, oral contraceptives, β -blockers)

etc^[2]. At least 3/4th of India's population has abnormal levels of cholesterol that increases the risk of cardio vascular diseases according to a study commissioned by the Indian Council of Medical Research (ICMR). Studies have shown that Indians are affected by heart diseases at a much younger age when compared to the people in the West. According to the statistics provided by the Indian government, 1/4th of all deaths among people in the 25-69 years age groups is due to cardio vascular diseases. There have been data on risk factors such as obesity, diabetes, hypertension and lifestyle habits such as poor diet, smoking and alcohol^[3]. The common treatment for hyperlipidemia is prescription of statins, bile acid sequestrants, fibric acid derivatives and nicotinic acid. Adverse effects associated with these drugs are headache, nausea, bowel upset, rashes, sleep disturbance, abnormal liver function, myositis, hyperuricemia, rise in serum transaminase, muscle tenderness and rise in Creatine Phosphokinase levels^[4] Indigenous systems of medicine like Siddha, Ayurveda and Unani mainly use medicinal plants for treatment of various ailments of human beings and animals. With the development of these systems, herbal plants are being sought after, both by clinicians and patients in search for new cure of diseases. Herbal medicine is a form of complementary and alternative medicine and is becoming increasingly popular in both developing and developed countries^[5]

II. Plasma lipoproteins

Lipoproteins are molecular complexes of lipids with proteins. Lipoproteins are macromolecular assemblies that contain lipids, including free and esterified cholesterol, triglycerides and phospholipids. Lipoproteins are synthesized in the liver.^[6]

Structure of lipoprotein:

Each lipoprotein particle consists of monolayer of polar, amphipathic lipids that surround the hydrophobic core. These polar lipids form a coating which shield hydrophobic core.^[6]

Classification of Lipoproteins: [7]

There are six main classes of lipoproteins shown in table 1:

- Chylomicron
- Chylomicron Remnants
- Very low-density lipoprotein cholesterol (VLDL-C)
- Intermediate density lipoprotein cholesterol (IDL-C)
- Low density lipoprotein cholesterol (LDL-C)
- High density lipoprotein cholesterol (HDL-C)

Lipoprotein	Density (g/ml)	Size (nm)	Major Lipids	Major Apoproteins
Chylomicrons	<0.930	75-1200	Triglycerides	Apo B-48, Apo C, Apo E, Apo A-I, A-II, A-IV

Lipoprotein	Density (g/ml)	Size (nm)	Major Lipids	Major Apoproteins
Chylomicron Remnants	0.930-1.006	30-80	Triglycerides Cholesterol	Apo B-48, Apo E
VLDL	0.930-1.006	30-80	Triglycerides	Apo B-100, Apo E, Apo C
IDL	1.006-1.019	25-35	Triglycerides Cholesterol	Apo B-100, Apo E, Apo C
LDL	1.019-1.063	18-25	Cholesterol	Apo B-100
HDL	1.063-1.210	5-12	Cholesterol Phospholipids	Apo A-I, Apo A-II, Apo C, Apo E

Table 1: six main classes of lipoprotein

III. Enzymes involved in lipoprotein metabolism

- Lipoprotein lipase (LPL)
- Hepatic lipase (HL)
- Lecithin cholesterol acyl transferase (LCAT)
- Cholesteryl ester transfer protein (CETP)
- Microsomal triglyceride protein (MTP)
- Acyl Co-A transferase (ACAT)

IV. Hyperlipidemia classification:

Hyperlipidemia in general can be classified to: **1. Primary hyperlipidemia:** It is also called as familial due to a genetic defect; it may be monogenic: a single gene defect or polygenic: multiple gene defects. Primary hyperlipidemia may be treated by anti-lipidemic drug. It is again classified into 5 types shown in table 2.

Type	Disorder	Cause	Occurrence	Elevated plasma lipoprotein
I	Familial hyperchylomicronemia/ primary hyperlipoproteinemia	Lipoprotein lipase deficiency or Altered ApoC2	Very rare	Chylomicrons
IIa	Familial hypercholesterolemia/ Or Polygenic hypercholesterolemia	LDL receptor deficiency	Less common	LDL
IIb	Familial combined hyperlipidemia	Decreased LDL receptor	Commonest rare	LDL and VLDL
III	Familial Or Polygenic	Defect in Apo E- 2 synthesis and increased Apo	Common	IDL
IV	Familial hypertriglyceridemia	Increased VLDL production and decreased excretion	Less common	LDL
V	Endogenous hypertriglyceridemia	Increased VLDL production and decreased LPL	Less common	VLDL and chylomicrons

Table 2: Primary Hyperlipidemia Classification

2.Secondary hyperlipidemia: It is acquired because it is caused by another disorder like diabetes, nephritic syndrome, chronic alcoholism, hypothyroidism and with use of drugs like corticosteroids, beta blockers and oral contraceptives. Secondary hyperlipidemia together with significant hypertriglyceridemia can cause pancreatitis. (17-20R)

Classification of hyperlipidemia:

- A. Metabolic influences: diabetes, obesity, hyperuricemia, glycogen storage diseases type I
- B. Hormonal influences: Insulin, estrogen, thyroxine.
- C. Nutritional influences: Alcohol, high carbohydrate intake.
- D. Disease state: Renal disease, Renal Failure, Nephritic syndrome.
- E. Drugs: Diuretics, B-Blockers, influences: estrogen replacement therapy.

V. Causes of hyperlipidemia^[8]

Genetic factors:

Hyperlipidemia is associated with genetic disorders. Most hereditary lipid disorders are common among generations of families with obesity problems. Some familial lipid disorders can directly results in overproduction of cholesterol. Another condition, familial combined hyperlipidemia can lead to high cholesterol levels including high TG levels. Another hereditary condition called familial Defective Apolipoprotein B-100, can cause LDL blood cholesterol to increase and also raise TC levels.

Medications:

Glucocorticoids and estrogens elevate TG and raise levels of HDL-C. Oral contraceptives affect atherosclerotic risk depending on the doses of progestin/estrogen. Short term use of thiazide raises TC, TG, and LDL-C. Beta blockers raise TG and lower HDL-C.

Obesity:

For the given body mass index (BMI), obesity is associated with hyperlipidemia. Several studies have indicated that weight reduction was associated with increase in HDL-C levels and significant decrease in total, LDL and VLDL cholesterol and TG levels.

Diet:

Diet rich in saturated fatty acids increase plasma TG levels moderately whereas polyunsaturated fatty acids reduce them. Animal products like meat, egg yolk, sea food and whole fat dairy products provide the bulk of dietary cholesterol.

Diabetes and Insulin resistance:

Type II diabetes is related to a number of lipid and lipoprotein abnormalities. Lipid abnormality is closely connected with insulin resistance and hyperinsulinemia is hypertriglyceridema. Generally insulin resistance is associated with hyperlipidemia characterized by high plasma VLDL and TG concentration and low HDL-C concentration.

VI. Drugs classes for hyperlipidemia^[9]

Drug (daily dose)	Mechanism of action	Effect on lipids (%)
1. HMG-CoA reductase inhibitors Lovastatin (10-80 mg) Simvastatin (5-40 mg) Atorvastatin (10-80 mg) Rosuvastatin (5-20 mg)	Cholesterol synthesis by inhibition of rate limiting HMG-CoA reductase.	LDL 20-55 HDL 15-30 TG 10-35
2. Bile acid sequestrants Cholestyramine (4-16 g) Colestipol (5-30 g)	Bile acid absorption, hepatic conversion of CH to bile acids, LDL receptors on hepatocytes.	LDL 15-30 HDL 3-5 TG not affected
3. Fibric acid derivatives Gemfibrozil (1200 mg) Bezafibrate (600 mg) Fenofibrate (200 mg)	Activity of lipoprotein lipase, release of fatty acids from adipose tissue	LDL 20-55 May LDL when TG is high HDL 15-30 TG 10-35

4. Nicotinic acid (2-6 g)	Production of VLDL, Lipolysis in adipocytes.	LDL 15-25 HDL 20-35 TG 20-50
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Table 3 : Drugs used in the treatment of hyperlipidemia.

VII. CONCLUSION:

Hyperlipidemia is serious cause because it is associated with blood cholesterol and reduced quality of life. Hyperlipidemia is leading cause of death worldwide, including diabetes, heart failure, hypertension, stroke, and some types of cancer. Awareness regarding hyperlipidemia is low. Health education regulatory should provide to students regarding risk factors of hyperlipidemia and

impactful way to reduce the risk by regulating exercising and good quality of food intake in their lifestyle. Furthermore, new treatment therapy. However, there are still an abundance of traditional uses Hence, further research is needed to exploit in herbal treatment.

Conflict of interest:

Nil

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