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A REVIEW

Lipid profile and role of LDL in cardio-vascular disease

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ABSTRACT

Monitoring and maintaining healthy levels of lipids is important in staying healthy. While the body produces the cholesterol needed to function properly, the source for some cholesterol is the diet. Eating too much of foods that are high in cholesterol, saturated fats, and trans unsaturated fats (trans fats) or having an inherited predisposition can result in a high level of cholesterol in the blood. The extra cholesterol may be deposited in plagues on the walls of blood vessels. Plaques can narrow or eventually block the opening of blood vessels, leading to hardening of the arteries, and increasing the risk of numerous health problems, including heart disease (Do*et al.*, 2013) and stroke. LDL and Oxidised LDl are the main culprit for developing health problems. A high level of triglycerides in the blood is also associated with an increased risk of developing cardio-vascular disease (CVD), although the reason for this is not well understood. Studies(Kuklina *et al.*, 2000) show that a large proportion of adults with high levels of low-density lipoprotein cholesterol (LDL-C) remain untreated or undertreated despite growing use of lipid-lowering medications.

Key Words : Lipids, LDL, Triglycerides, Cholesterol, Fats

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Lipids are a group of fats and fat-like substances that are important constituents of cells and sources of energy. A lipid profile measures the level of specific lipids in the blood.

Two types of lipids, cholesterol and triglycerides, are transported in the blood by lipoprotein particles. Each particle contains a combination of protein, cholesterol, triglyceride, and phospholipid molecules. The particles measured with a lipid profile are classified by their density into high-density lipoproteins (HDL), low-density lipoproteins (LDL) and very low-density lipoproteins (VLDL).

Studies (Dai *et al.*, 2009) have revealed that patterns of change with age, in blood lipid components vary significantly among gender and racial groups. Increase in body fatness among children is consistently associated with adverse change in blood lipids.

A lipid profile typically includes :

- Total cholesterol-this test measures all of the cholesterol in all the lipoprotein particles.
- High-density lipoprotein cholesterol (HDL-C) - measures the cholesterol in HDL particles; often called “good cholesterol” because it removes excess cholesterol and carries it to the liver for removal.
- Low-density lipoprotein cholesterol (LDL-C)- calculates the cholesterol in LDL particles; often called “bad cholesterol” because it deposits excess cholesterol in walls of blood vessels, which can

contribute to atherosclerosis. Usually, the amount of LDL cholesterol (LDL-C) is calculated using the results of total cholesterol, HDL-C and triglycerides.

– Triglycerides- measure all the triglycerides in all the lipoprotein particles; most is in the very low-density lipoproteins (VLDL).

Some other information may be reported as part of the lipid profile. These parameters are calculated from the results of the tests identified above.

– Very Low-density lipoprotein cholesterol (VLDL-C)- calculated from triglycerides/5; this formula is based on the typical composition of VLDL particles.
– Non-HDL-C - calculated from total cholesterol minus HDL-C.
– Cholesterol/HDL ratio - calculated ratio of total cholesterol to HDL-C.

An extended profile (or advanced lipid testing) may also include low-density lipoprotein particle number/ concentration (LDL-P). This test measures the number of LDL particles, rather than measuring the amount of LDL-cholesterol. It is thought that this value may more accurately reflect heart disease risk in certain people.

Oxidized LDL causes endothelial cells to secrete "adhesion molecules" that allow white blood cells to penetrate the inner lining of the artery (the endothelium). This is where initial fatty streaks and atherosclerotic plaques develop (Libby, 2006).

Oxidized LDL turns on white blood cell gene expression that enables them to convert into foam cells, which results in continuous accumulation of oxidized LDL in the atherosclerotic plaque (Tontonoz *et al*., 1998).

Oxidized LDL enhances the process whereby immune cells, foam cells, smooth muscle cells and endothelial cells degrade collagen, which leads to the rupture of the fibrous plaque (Libby, 2008).

The endothelium requires *nitric oxide* to function properly. A hallmark characteristic of *endothelial dysfunction* is a lack of nitric oxide. Oxidized LDL impairs the endothelial cells' ability to produce nitric oxide (Zhang *et al.,* 2008).

Perhaps no other nutrient has demonstrated better *anti-LDL oxidation* effects than pomegranate. Also specific fats(omega-3s and certain monounsaturated fats) are extremely beneficial in reducing vascular disease risk (Harris *et al.,* 2008 and Perez-Jimenez *et al.,* 2007).

Certain studies have shown that polyphenols protect against LDL oxidation, and also boost beneficial HDL and lower absolute LDL levels in the blood (Aviram and Fuhrman,2002; Martin-Nizard *et al.,* 2003; Janisch *et al.,* 2004; Sies *et al*., 2005; Mursu *et al.,* 2004; Baba *et al*., 2007a; Covas *et al*., 2006; Baba *et al*., 2007b and Zern *et al*., 2005).

The NCEP recommends a daily intake of 2000 mg of plant stanols/sterols as part of a treatment plan to enhance LDL-C lowering (NCEP, 2002). According to the FDA, products containing at least 400 mg per serving of plant sterols and stanols, eaten twice a day with meals for a daily intake of at least 800 mg as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease (Food Labeling, 2010). Phytosterols, also referred to as stanols or sterols, are plant-derived substances that are structurally similar and functionally analogous to cholesterol in humans (Ostlund, 2002).When ingested, phytosterols displace cholesterol on binding sites within the digestive tract, inhibiting intestinal cholesterol absorption and increasing biliary excretion (Ostlund, 2002; Maki *et al.,* 2012 and Narmen *et al*., 2000). This results in a reduction of circulating LDL-C and other apolipoprotein B–containing lipoprotein particles in the bloodstream (Ostlund, 2002; Maki *et al.*, 2012; Kerckhoffs *et al.,* 2002 and Katan *et al.,* 2003).

There are two types of cholesterol: "good" and "bad." It's important to understand the difference, and to know the levels of good and bad cholesterol in blood. studies (Huxley *et al.*, 2002) reveil that lower blood cholesterol is associated with a reduced risk from coronary heart disease (CHD)

Normal cholesterol levels are :

–Desirable - Less than 200 mg/dL
–Borderline high - 200 to 239 mg/dL
–High - 240 mg/dL and above.

High cholesterol levels can cause: Atherosclerosis, Higher coronary heart disease risk, Heart attack, Angina, Stroke and mini-stroke

Foods high in saturated fats, sedentary lifestyle, overweight, smoking, consumption of alcohol can increase cholesterol in blood

Diet can play an important role in lowering cholesterol. foods such as oatmeal, oat bran, fish, walnuts, olive oil. Foods with added plant sterols or stanols can lower cholesterol

Foods are now available that have been fortified

with sterols or stanols- substances found in plants that help block the absorption of cholesterol.

Margarines, orange juice and yogurt drinks with added plant sterols can help reduce LDL cholesterol by more than 10 per cent. Plant sterols or stanols in fortified foods don't appear to affect levels of triglycerides or of high-density lipoprotein (HDL), the "good" cholesterol. Another type of fat found in blood are Triglycerides. Body uses them for energy.

Some triglycerides are needed for good health. But high triglycerides can raise risk of heart disease and may be a sign of metabolic syndrome is the combination of high blood pressure high blood sugar, too much fat around the waist, low HDL ("good") cholestrol and high triglycerides metabolic syndrome increases your risk for heart disease, diabetic and stroke.

A blood test that measures cholesterol also measures triglycerides. For a general idea about triglycerides level

–Normal is less than 150.

–Borderline-high is 150 to 199.

–High is 200 to 499.

–Very high is 500 or higher.

Overall, 30-40 per cent of patients with diabetes have triglyceride levels > 200 mg/dl, and 10 per cent have triglycerides > 400 mg/dl (Cowie and Harris, 1995).

Certain medicines may also raise triglycerides. These medicines include:

– Taxocifen

– Steroids.

– Beta blockers

– Diuretics

– Estrogens

– Birth control pills

High triglycerides usually don't cause symptoms.

But if your high triglycerides are caused by a genetic condition, one may see fatty deposits under skin. These are called xanthomas.

Conclusion :

Lipids are utilized or synthesized from the dietary fats. There are in addition numerous biosynthetic pathways to both break down and synthesize lipids in the body.

There are, however, some essential lipids that need to be obtained from the diet. The main biological functions of lipids include storing energy. Lipids also form the structural components of cell membranes and form various messengers and signalling molecules with in the body. Both absolute LDL level and LDL oxidation are involved in atherosclerotic processes and heart attack risk.The life style may be altered to maintain lipid profile in the specified range but if it does not work then medicines containing Statins,Aspirin and Fenofibrate may be consumed to avoid stroke, CVD or Heart attack.

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