

Herbal remedies on hyperlipidemia

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Abstract

Hyperlipidemia involves abnormally elevated levels of any or all lipids and/or lipoproteins in the blood. Hyperlipidemia is a medical condition characterized by an increase in one or more of the plasma lipids. Elevated lipids levels (cholesterol, fats, and triglyceride) predispose the patient to a various serious and sometimes lethal complications such as cardiovascular disease, cerebral strokes, hepatic and renal dysfunction. There are two major types of hyperlipidemia. The first type is the primary hyperlipidemia which is usually familial type caused by genetic abnormalities. The other type is called secondary hyperlipidemia which is resulted from predisposing factors like obesity, thyroid dysfunction, alcoholism, drugs (B-blockers), hypothyroidism, and chronic renal failure. Hyperlipidemia could be treated either by changing life style and follow a healthy behaviour or by using medications (hypolipidemic agents) or both to reach the therapeutic goal which is controlled blood lipid levels. On other hand, huge number of medicinal plant extracts were tested and show significant advantage in controlling blood levels of lipids. This review article will discuss this disease and different types of hypolipidemic agents. Management of hyperlipidemia requires multi-team intervention include medical, nutritional and lifestyle modifications. Searching on the internet using the Google search engine was the main source of data as well as books. This review will try to draw a picture about hyperlipidemia; its risk factors and management. Management strategies depend on the specific lipid abnormality. Many countries or regions have developed their own guidelines. Prevention and treatment of dyslipidaemia consists assessment, establishment of treatment goal, increase activity level, dietary modification, medical therapy, follow up, re-assess.

Keywords: Hyper lipidemia; Hypolipidemic agents; Complications; Cholesterol; Fibrates; Statins

1. Introduction

All the lipids of human plasma are transported as complexes with proteins (Apoproteins) because they are insoluble in plasma. Except for fatty acids which are visible in plasma, and bound chiefly to albumin, the lipids are carried in special macromolecular complexes termed lipoproteins. A number of metabolic disorders that involve elevations in plasma concentrations of any of the lipoprotein species are thus termed hyperlipidemias.¹

Hyperlipidemia is a condition when abnormally high levels of lipids i.e. The fatty substance are found in the blood.² These complications are usually related to the formation of atherosclerosis and its related disorders such as cardiovascular disease, peripheral vascular disease, cerebrovascular disease, and brain strokes.³

The hyperlipidemia is traditionally defined as conditions in which the concentration of cholesterol or triglyceride-carrying lipoproteins in plasma exceeds an arbitrary normal limit.^{4, 5} The small intestine absorbs fat from diet and transfers it into chylomicrons which are sent to peripheral tissues via the bloodstream. The lipoprotein lipase enzyme breaks down chylomicrons, and fatty acids are transferred into adipose tissues and muscle. The liver takes the chylomicron remnants and subsequently starts the process of very-low-density lipoproteins (VLDLs) synthesis. High

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Density Lipoprotein HDL is produced in the liver. HDL transports cholesterol from the body to the liver. For this reason, HDL is called “good cholesterol” lipoprotein. ^{6-7,8}HDL also work as anti-inflammatory, antioxidant, and antithrombotic effects. HDL is cardio protective molecules. Hyperlipidemia is fundamentally classified as either primary (familial) caused by specific genetic abnormalities, or secondary (acquired) which caused by another underlying disorder.

Hyperlipidemia is considered one of the major risk factors causing to cardiovascular diseases (CVDs). CVDs accounts for 1/3 rd of total deaths around the total world, it is believed that Cardiovascular diseases will turn out to be the main cause of death and incapacity worldwide by the year 2020.⁹⁻¹¹

2. Plasma lipoproteins

Water insoluble plasma lipids are transported in the following classes of lipoproteins.

- Chylomicrons
- Chylomicron remnants
- Very low density lipoproteins (VLDL)
- Intermediate density lipoproteins (IDL)
- Low density lipoproteins (LDL)
- High density lipoproteins (HDL)
- Lipoproteins (a) ¹²

Table 1 Serum lipid levels (mg/dl) and the risk of ischemic heart disease

| Lipid | Desirable level (Low risk) | Abnormal level (High-risk) |
|-------------------|----------------------------|----------------------------|
| Total cholesterol | < 200 | > 240 |
| LDL cholesterol | < 130 | > 160 |
| HDL cholesterol | > 60 | < 40 |
| Triglycerides | < 200 | > 400 |

3. Symptoms

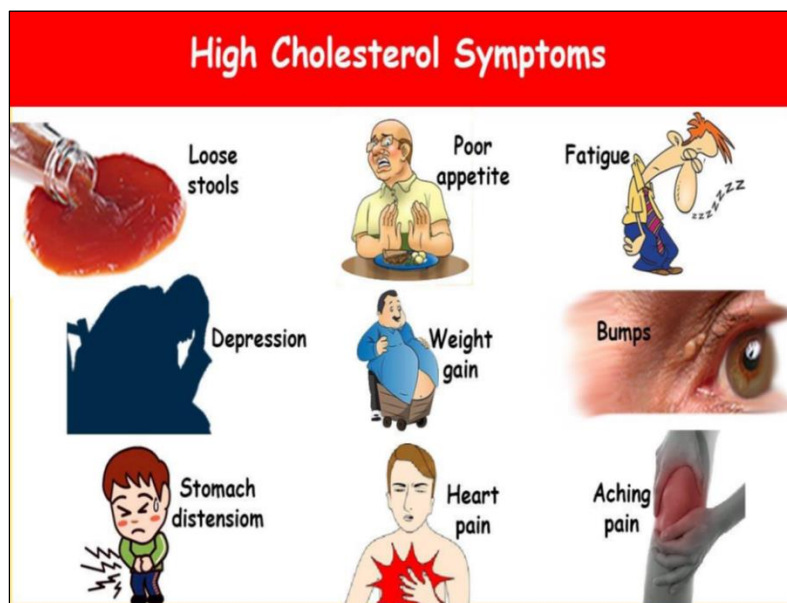


Figure 1 Signs and symptoms of hyperlipidemia

The signs and symptoms of hyperlipidemia may be not noticeable and the patient discovers this disorder by routine blood tests. In general, patient may suffer chest pain, abdominal pain, hepatic enlargement, spleen hypertrophy, heart diseases, and athermanous plagues in blood vessels.¹³ Other symptoms are illustrated in (figure1).

4. Classification of hypelipidemia

4.1. On the idea of lipid type

Hypercholesterolemia-In this the level of cholesterol is elevated.

Hypertriglyceridemia-It is outlined as level of triglycerides elevated

4.2. On the idea of causing factor (fig.2)

Primary (Familial: hyperlipidemia)

It is also called familial due to a genetic defect, it may be monogenic: a single gene defect or polygenic: multiple gene defects. Primary hyperlipaemia can usually be resolved into one of the abnormal lipoprotein pattern summarized.

- Type I–Raised cholesterol with high triglyceride levels.
- Type II–High cholesterol with normal triglyceride levels.
- Type III–Raised cholesterol and triglycerides.
- Type IV–Raised triglycerides, atheroma and uric acid.
- Type V–Raised triglycerides

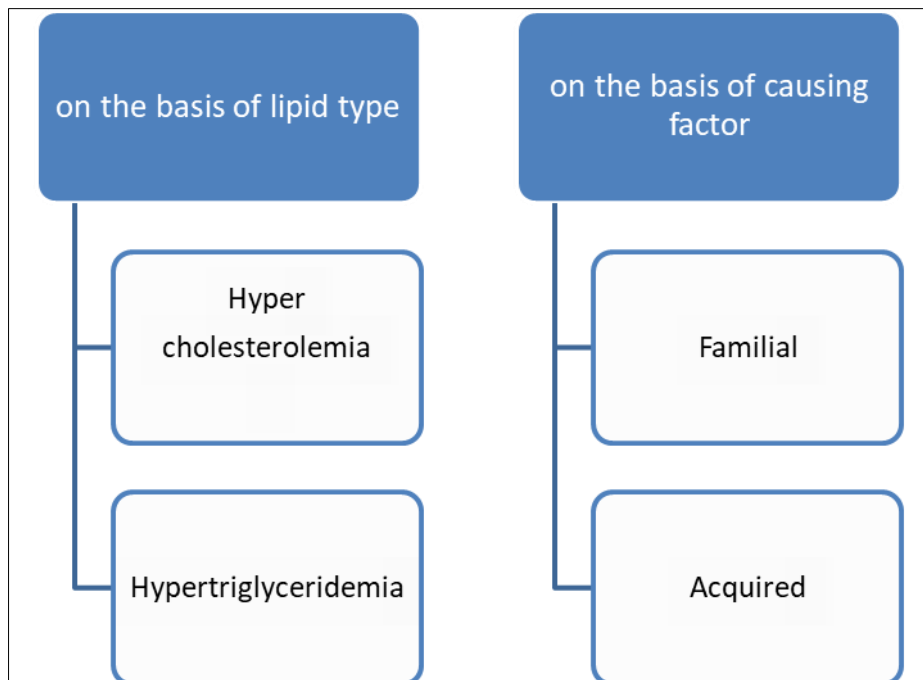


Figure 2 Idea of causing factor

4.3. Secondary (Acquired hyperlipidemia)

It is acquired because it is caused by another disorder like diabetes, glomerular syndrome, chronic alcohol intake, hypothyroidism and with use of drugs like corticosteroids, beta blockers and oral contraceptives.

Secondary hyperlipidemia combined with significant hyper triglyceridemia can cause pancreatitis.¹⁴

5. Causes

Sterol, fatty acids, trans fat in the following food may increase the lipid level in blood:

- Dairy products.
- Ice cream pastries.
- Fried and junk foods.
- Meat etc.¹⁵
- Excessive use of alcohol also increases the risk of hyperlipidemia. Certain drugs as steroids and β - blockers may cause hyperlipidemia

5.1. Several other causes of hyperlipidemia

- Obesity.
- Genetic or inheritance.
- Smoking.
- Several drugs such as corticosteroids, estrogen, betablockers may risk for hypertriglyceridemia.
- Alcohol, steroids, hypothyroidism, kidney failure etc.
- Low exercise ¹⁷
- Age and gender. It has been shown that cholesterol levels rise as the person gets older.¹⁸⁻¹⁹ Heredity has also been a modifying factor for the progression of hyperlipidemia as it has been noted that the genes partly determine the amount of cholesterol body makes.²⁰

6. Pathogenesis of hyperlipidemia

During the early stages of the hyperlipidemia, blood monocytes and platelets attach to a vessel wall at the sites of endothelial damage. The release of the mediators such as platelet derived growth factors leads to a growing of smooth cells in the intimal and medial lining of the vessel, collagen synthesis, cholesterol uptake and the initial for the hyperlipidemic plaque results. Plaque ruptures are resulting in the acute syndromes of unstable angina, myocardial infarction and sudden cardiac death .²¹

6.1. Conventional medicines used in the treatment of hyperlipidemia

Antihyperlipidemic drugs are those drugs used to reduce high levels of lipids such as cholesterol in the blood. Medicinal plants play an important role in management of hyperlipidemia. Hyperlipidemia is related to cardiovascular disorder and obesity. Synthetic hypolipidemic drugs are extensively used to prevent such disorders, but these drugs have other adverse effects. Due to adverse side effects of these drugs, there is a demand for new herbal compounds for the treatment of hyperlipidemia. The potency of herbal drugs is Significant and they have negligible side effects than the synthetic hypolipidemic drugs

6.2. Naturally occurring Medicinal plants, herbs having Hyperlipidemia/Antihyperlipidemia potential

Acacia catechu Willd. belongs to the family Fabaceae also termed as cutch tree was native to Africa. Pakistan, India, Thailand, and Bangladesh are the primary origins of this plant *Acacia catechu* catechu has traditionally been used to cure a variety of disorders, including gastrointestinal and stomach ailments, leprosy, and skin infections.^{22,23}

Catechin was used as an astringent and has anti-oxidant activity. The bioactivities identified was hypoglycemic action in rats, antibacterial activity, immunomodulatory activity, antifungal activity, anti-inflammatory activity and antimycotic activity.²⁴

6.3. *Commiphora mukul*

Commiphora mukul (Burseraceae) is extensively dispersed in Pakistan and India and its gum-resin is believed to be beneficial in the treatment of rheumatism, arthritis and associated illnesses. Pharmacological investigations on the crude drug, as well as various fractions and pure components of *C. mukul* have showed strong anti-inflammatory, anti-rheumatic and hypocholesteremic/ hypolipemic activity.²⁵

6.3.1. *Vitis vinifera*

Grape plant (*Vitis vinifera* L.) is one of the most food and commercially significant plant; belong to vitaceae family. Grapes contain a broad array of polyphenol chemicals, including flavonoids, phenolic acids, and resveratrol. Grapes include catechin, gallic acid, epigallocatechin, tannins, anthocyanins, flavonols, and epicatechin gallate, including proanthocyanidins, making them one of the most popular and commonly produced fruits on the planet.^{26, 27}

6.3.2. *Rubia cordifolia*

Rubia cordifolia, which belongs to the family Rubiaceae also known as Indian Madder or Common Madder, is a species of flowering plant in the coffee family. a broad range of pharmacological activities has been discovered in streptozotocin induced diabetic rats, resulting in antihyperglycemic, hypotriglyceridemic effects.²⁸

6.3.3. *Terminalia arjuna*

Terminalia arjuna is a huge evergreen tree that belongs to the family Combretaceae. It may be found in abundance on northern side of India. The beneficial portion of this plant is bark which discovered to have several therapeutic actions including cardiogenic, antiulcer, antidiabetic, astringent, treating allergies and skin problems, anti-inflammatory activity and are utilized in Indian traditional medicine²⁹

The bark has proved to have anti-atherogenic effect on hypercholesterolemic rabbits. The bioactivity of this ethanolic extract of the bark was due to the presence of flavonoids, tannins and plant sterols.³⁰

6.3.4. *Mimosa pudica*

Mimosa pudica (Mimosaceae) known as chue Mue, is a stout straggling prostrate shrubby plant with the compound leaves sensitive to touch. It has spinous stipules and globose pinkish flower heads and grows asweed in almost all parts of the country.³¹

Mimosa pudica is used for its anti-hyperglycemic³² anti-diarrhoeal³³ anti-convulsant³⁴, cytotoxic³⁵ and hepatoprotective properties³⁶

7. Conclusion

The hypelipdemia condition is major risk factor for cardiac disease. Hypelipdemia can be treated by recent drugs and diet food chart, home remedies, regular physical exercise. If attentive care is given to diet maintenance and fitness may reduce the risk of hyperlipidemic, CVD and many other disease .People who have familial history of hyperlipidemia to do routine lipid profile test regularly even they don't suffer any signs or symptoms of high blood lipids. This is very important to prevent and treat this serious disorder in a goal to prevent the development of complications. Considerable number of medications with significant safety could be prescribed by the physician depending on the degree of the disease and the health state of the patient. In addition, medicinal plants also have a role in the treatment of the disorder but this require a sufficient acknowledgment about the disease and the plant.

Compliance with ethical standards

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Disclosure of conflict of interest

All authors declare no conflict interest is exist.

References

- [1] Katzung BG. Basic and Clinical Pharmacology, 9th ed. A LangeMedical Pub. McGraw Hill Co., Singapore, (2004).
- [2] Amit G, Vandana S, Sidharth M. HYPERLIPIDEMIA: An Updated Review. Inter J of Biopharma & Toxicol Res 2011;1:81-89.

- [3] Shattat GF. A review article on hyperlipidemia: types, treatments and new drug targets. *Biomedical and pharmacology journal*. 2015;7(1):399-409
- [4] Verma, N. INTRODUCTION TO HYPERLIPIDEMIA AND ITS TREATMENT: A REVIEW. *International Journal of Current Pharmaceutical Research*,2016;9(1):614.
- [5] Goodman LS, Gilman A. *The pharmacological basis of therapeutics*. Macmillan. New York. 1970.
- [6] Block ER, Edwards D. Effect of plasma membrane fluidity on serotonin transport by endothelial cells. *American Journal of Physiology*.1987;253:672–678
- [7] Brunner LJ, Vadieli K, Luke DR. Cyclosporine disposition in the hyperlipidemic rat model. *Research Community*.1988;59:339–348.
- [8] Diebold K, Michel G, Schweizer J, Diebold-Dorsam M, Fiehn W, Kohl B. Are psychoactive-drug-induced changes in plasma lipid and lipoprotein levels of significance for clinical remission in psychiatric disorders. *Pharmacopsychiatry*.1998;31:60–67.
- [9] Shattat GF. A review article on hyperlipidemia: types, treatments and new drug targets. *Biomedical and pharmacology journal*. 2015 May 3;7(1):399-409.
- [10] Gingham C, Bejan I, Ceck CD. Modern risk stratification in coronary heart disease. *J Med Life*. 2011 Nov 14;4(4):377-86. Epub 2011 Nov 24.
- [11] Jørgensen T, Capewell S, Prescott E, Allender S, Sans S, Zdrojewski T, De Bacquer D, de Sutter J, Franco OH, Løgstrup S, Volpe M, Malyutina S, Marques-Vidal P, Reiner Z, Tell GS, Verschuren WM, Vanuzzo D; PEP section of EACPR. Population-level changes to promote cardiovascular health. *Eur J Prev Cardiol*. 2013 Jun;20(3):409-21. doi:
- [12] RS Satoskar, Nirmala NR, Raakhi KT and SD Bhandarkar.(2017). *Pharmacology and pharmacotherapeutics*, 25th Ed. popular prakashan publication, 590-8.
- [13] Bhatnagar D, Soran H, Durrington PN. Hypercholesterolaemia and its management. *Bmj*. 2008;337.
- [14] Joseph, D. *Pharmacotherapy, A pathophysiological approach*, 8th edn, The McGraw Hill companies, Inc. 2011; pp370
- [15] Simons M, Keller P, Dichgans J, Schulz JB. Cholesterol and Alzheimer's disease: is there a link? *Neurology*. 2001 Sep 25;57(6):1089-93.
- [16] Travis AJ, Kopf GS. The role of cholesterol efflux in regulating the fertilization potential of mammalian spermatozoa. *J Clin Invest*. 2002 Sep;110(6):731-617. Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents. National Cholesterol Education Program. National Heart Lung and Blood Institute, Public Health Service, U.S. Department of Health and Human Services, NIH Publication No. 91-2732, Bethesda, MD, September 1991.
- [17] Lipman TH, Hayman LL, Fabian CV, DiFazio DA, Hale PM, Goldsmith BM, et al. Risk factors for cardiovascular disease in children with type I diabetes. *Nurs Res* 2000;49:160-166.
- [18] Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *Jama*2001;285:2486-2497
- [19] Grauvogel J, Daemmrich TD, Ryschich E, Gebhard MM, Werner J. Chronic alcohol intake increases the severity of pancreatitis induced by acute alcohol administration, hyperlipidemia and pancreatic duct obstruction in rats. *Pancreatol* 2010;10:603-12
- [20] Murphy SL, Xu J, Kochanek KD. Deaths: final data for 2010. *Natl Vital Stat Rep*. 2013 May 8;61(4):1-117. PMID: 24979972
- [21] 22. Devi VG, John A, Sreekala Devi R, Prabhakaran VA. Pharmacognostical studies on *Acacia catechu* willd and identification of antioxidant principles. *Int J Pharm Pharm Sci*. 2011; 3:108-11.
- [22] Satpudke S, Pansare T, Khandekar S. Review on *Arjuna* (*Terminalia Arjuna* Roxb.) with Special Reference To *Prameha* (Diabetes). *Int J Herb Med*. 2019; 8:1-5.
- [23] Sasikala TP, Kamakshamma J. Genetic diversity assessed through RAPD Markers in *Terminalia Pallida* Brandis. *J Pharm Sci Res*. 2015; 7:58-62.

- [24] Ramachandran C, Nair SM, Quirrin KW, Melnick SJ. Hypolipidemic effects of a proprietary Commiphora Mukul gum resin extract and medium-chain triglyceride preparation (GU-MCT810). *J Evidence-Based Complement Altern Med.* 2013; 18:248-56. <https://doi.org/10.1177/2156587213488601>
- [25] Rani DJ, Vijayanchali SS. Phytochemical Composition and antioxidant activity of fresh and dried grape (*Vitis vinifera*) fruit proportions. *Int J Innov Sci Res Technol.* 2021; 6:734-9.
- [26] Baranitharan M, Alarifi S, Alkahtani S, Ali D, Elumalai K, Pandiyan J, et al. Phytochemical analysis and fabrication of silver nanoparticles using *Acacia catechu*: An efficacious and ecofriendly control tool against selected polyphagous insect pests. *Saudi J Biol Sci.* 2021; 28:148-56.
- [27] Baskar R, Bhakshu LM, Bharathi GV, Reddy SS, Karuna R, Reddy GK, et al. Antihyperglycemic activity of aqueous root extract of *Rubia cordifolia* in streptozotocin-induced diabetes. *Int J Pharm Sci Res.* 2012; 3:123-30.
- [28] Maulik SK, Talwar KK. Therapeutic potential of *Terminalia arjuna* in cardiovascular disorders. *Am J Cardiovasc Drugs.* 2012; 12:157-63. 30.
- [29] Subramaniam S, Subramaniam R, Rajapandian S, Uthrapathi S, Gnanamanickam VR, Dubey GP. Antiatherogenic activity of ethanolic fraction of *Terminalia arjuna* bark on hypercholesterolemic rabbits. *Evidence-Based Complement Altern Med.* 2011b; 2011. <https://doi.org/10.1093/ecam/neaq003>. PMID:21785628.PMCid:PMC3136348
- [30] Ghani A. Medicinal plants of Bangladesh with chemical constituents and uses. 2nd ed. Dhaka: Asiatic Society of Bangladesh; 1998
- [31] Umamaheswari S, Prince PS. Antihyperglycemic effect of Ilogen Excel, an ayurvedic herbal formulation in streptozotocin-induced diabetes mellitus. *Acta Pol Pharm* 2007;64(1):53-61.
- [32] Balakrishnan N, Suresh D, Pandian GS, Edwin E, Sheeja E. Anti-diarrhoeal potential of *Mimosapudica* root extracts. *Indian J Nat Prod* 2006;22(2):21-23.
- [33] Bum EN, Dawack DL, Schmutz M, Rakotonirina A, Rakotonirina SV, Portet C, et al. Anticonvulsant activity of *Mimosa pudica* decoction. *Fitoterapia* 2004;75(3-4):309-314.
- [34] Chowdhury SA, Islam J, Rahaman M, Rahman M, Rumzhum NN, Sultana R, et al. Cytotoxic, antimicrobial and antioxidant activities of the different plant parts of *Mimosa pudica*. *S J Pharm Sci* 2008;1(1&2):80-84.
- [35] Rajendran R, Hemalatha S, Akasakalai K, Madhu- Krishna CH, Sohil B, Sundaram V, et al. Hepatoprotective activity of *Mimosa pudica* leaves against Carbon tetrachloride induced toxicity. *J Nat Prod* 2009;2:116-122