

A Comprehensive Review on Antihyperlipidemic Activity - Medicinal Plants

*Dharani.E¹, Dr.Senthil kumar.S.K², Sarala.A³, Ayisha Farhana. J⁴,
Bathrinarayan.M⁵, Dharshansarathy.R⁶, Dhanashree.M. R⁷

^{1,4,5,6,7} Students, B. Pharm, 7th semester, Arunai college of pharmacy, Tiruvannamalai.

² Principal, Dr. Senthil kumar. S.K, Arunai College of pharmacy, Tiruvannamalai.

³ Associate professor, Department of pharmaceutical chemistry, Arunai college of pharmacy, Tiruvannamalai.

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ABSTRACT:

The biggest risk factor for coronary heart disease is hyperlipidemia. Allopathic antihyperlipidemic medications are now linked to a wide range of adverse effects. Hyperlipidemia can be treated locally with herbs without experiencing any negative side effects and at a reasonable cost. Traditional medicinal approaches, which are mostly based on plants, herbs and shrubs have always been crucial to the development of the world's health system. Approximately 10 medicinal plants have been identified in this analysis as having strong hypolipidemic effects between the year 2010 and 2023. In developed countries over the past ten years, there has been an upsurge in the usage of medicinal plants. The focus of this review is on hyperlipidemia and the role of plants in treating it.

KEYWORDS: Anti-hyperlipidemic, Coronary heart disease, Medicinal plants.

I. INTRODUCTION:

Hyperlipidemia is a condition when abnormally high levels of lipids, i.e., fatty substances, are found in the blood. This condition is called hypercholesterolemia or hyperlipoproteinemia [1]. Lipids are fats found in the bloodstream and are involved in the structure and function of cells [2]. Hyperlipidemia is a disarray of lipid metabolism produced by the elevation of plasma concentrations of the diverse lipid and lipoprotein fractions, which are sources of cardiac diseases [3].

Diabetes mellitus is also associated with hyperlipidemia and a profound alteration in the concentration of lipids [4]. Changes in the concentration of lipids with diabetes contribute to the development of vascular diseases. Excessive levels of blood cholesterol accelerate atherogenesis and lowering high blood cholesterol reduces the incidence of CHD. One of the risk factors for coronary heart disease is elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C)

and lower high-density lipoprotein cholesterol (HDL-C) [5], [6], [7], [8].

Hyperlipidemia is characterised by elevated levels of lipids that can be caused by a variety of genetic or acquired disorders [9]. The main factors responsible for hyperlipidemia include changes in lifestyle habits, in which risk factors include mainly poor diet, i.e., fat intake greater than 40 percent of total calories, saturated fat ingestion more than 10 percent of total calories and cholesterol ingestion greater than 300 mg per day [10].

Classification of lipid concentration: The lipids are can be classified as TC, TG, LDL, HDL and very low-density lipoprotein (VLDL).

Total cholesterol (TC):

According to the guidelines of the National Cholesterol Education Programme (NCEP), TC concentration levels higher than 240 mg/dL are referred to as hyperlipidemic. Epidemiological evidence suggests that the risk of cardiac events decreases as TC level falls to approximately 150 mg/dL [11-12].

Triglyceride (TG):

Triglycerides are carried in the blood by VLDL. The excess calories, alcohol or sugar in the body get converted into triglycerides and stored in fat cells throughout the body. The normal concentration of triglycerides is 150 mg/dL. More than 200–499 mg/dL is considered high and more than 500mg/dL is considered high concentration, which is dangerous for the development and progression of various CVDs [13].

LDL (Low Density Lipoprotein) Cholesterol:

LDL is also commonly referred as bad cholesterol and it is produced by liver and carry cholesterol and other lipids from the liver different

areas of the body like muscles, tissues, heart and organs. According to NCEP guidelines, normal concentration of LDL is below 100mg/dL and high concentration is 160-189 mg/dL. LDL increases the risk of heart disease [14].

HDL (High Density Lipoprotein) Cholesterol:

HDL is also called as good cholesterol and it is produced by the liver to carry cholesterol and other lipids from tissues back to liver for degradation. High level of HDL cholesterol as a good indicator of a healthy heart. Normal range of HDL is 60mg/dL and HDL concentration range is below 40mg/dL are considered as major risk factor for CVDs [15].

VLDL Cholesterol:

VLDL is similar to LDL cholesterol in the sense that it contains mostly fat and not much protein. VLDL cholesterol is the lipoproteins that carry cholesterol from liver to organs and tissues in the body. They are formed by a combination of cholesterol and triglycerides. It also associated with atherosclerosis and heart diseases [16].

Classification of hyperlipidemia:

They are classified into two types and they are

- Primary
- Secondary

Primary: It is also known as Familial hyperlipidemia and they are divided into five types;

Type 1: Raised cholesterol with high triglyceride

Type 2: High cholesterol with normal level of triglyceride

Type 3: High cholesterol and triglycerides

Type 4: Raised triglycerides, and raised uric acid

Type 5: Raised triglycerides

Secondary:

It is also called Acquired hyperlipidemia and secondary dyslipoproteinemia.

It is associated with marked hypertriglyceridemia and may cause pancreatitis and complication of the chylomicronemia disease.

II. METHODOLOGY:

Journal issues from 2010 to 2023 were searched for electronically using Research Gate, Science Direct, and Google Scholar. Regardless of language, all full-text, open-access scientific publications were taken into account. The scientific names of 10 medicinal plants with anti-hyperlipidemic properties were the search terms used in the query.

Anogeissus leiocarpus;

Anogeissus leiocarpus commonly known as African birch and Bambara. It belongs to the family Combretaceae. *A. leiocarpus* is a tall deciduous tree native to the savannas of tropical Africa. Phytochemical screening of the plant reveals alkaloids, flavonoids, saponins, tannins and polyphenolic compounds. It is used in traditional medicines in Africa to cure various diseases, antibacterial, antifungal, Anti-plasmodial, anthelmintic, hepatoprotective, antihyperlipidemic and anti-oxidant. *A. leiocarpus* mechanism is similar to that of antihyperlipidemic agents like statins and fibrates, whose LDL-cholesterol clearance and decrease in hepatic VLDL cholesterol. *Anogeissus leiocarpus* 400g roots are extracted in water/ethanol (5:5) for 72hrs. About 30 g of hydroethanolic extract was obtained and suspended in frozen 75% ethanol within 24hrs. Total extract at a dose of 100mg/kg⁻¹ and supernatant fraction (100mg/kg⁻¹) are administered to fructose-overloaded mice and significantly decrease triglyceride levels and VLDL cholesterol levels compared to hyperlipidemic controls. The antihyperlipidemic activity is performed by fructose-overloaded mice. Thirty mice are used in this activity [17]

Argyreia pierreana (AP) and Mateleadenticulata (MP):

It belongs to the families Convolvulaceae (*Argyreia pierreana*) and Apocynaceae (*Mateleadenticulata*). The presence of phytoconstituents includes flavonoids, phenols, terpenoids, tannins, alkaloids and glycosides. It is used as an antihyperlipidemic and antidiabetic antioxidant. Hydroethanolic extract is prepared by using the Soxhlet apparatus at 60–70 °C for 4 hrs. A crude was prepared by using the film dispersion technique. Both extracts of MDECE (*Matelea Denticulata* Ethanolic Crude Extract) and APECE (*Argyreia Pierreana* Ethanolic Crude Extract) at a dose of 400 mg/kg are given to type 2 diabetes rats and the result is reduced TC, TG, LDL and decreased HDL. The lower dose of MMEs (Mixed Micelle Extracts) shows higher antihyperlipidemic activity. Type 2 diabetes was induced in HFD (High Fat Diet) rats and the low-dose streptozotocin-induced diabetes rat method is used [18].

Baillonellatoxisperma:

It is belonged to the family Sapotaceae and the wood part is mostly used and its bark is used for medicinal properties. Fruits parts are used for cooking and cosmetic and the fruits are rich in macro and micro nutrients. Phyto

constituents' presence are polyphenols, flavonoids and procyanins. It is used as antihyperglycemic, antioxidant and antihyperlipidemic. Hydroethanolic extract is prepared by maceration method. The pulp 100g was ground and maceration for 48hrs with 800mL of solvent (water/ethanol 1:1 v/v). The dose (400mg/kg) of hydroethanolic extract offruit (*Baillonellatoxisperma*) is given to streptozoin induced diabetic rats and result is lowered triglyceride and total cholesterol. Hypotriglyceridemic activity is stimulate the insulin sensitivity and inhibit hepatic triglyceride production and the extract also inhibit the cholesterol esterase. The extract also decreases cardiovascular risk through reduction of CRR, AC and non- HDL. The effect would reflect the beneficial effect of the extract lipid profile. Streptozotocin induced diabetic rats' method is used [19].

Duvaliacorderoyi:

It belongs to the family apocynaceae. This plant is traditionally used for hypertension and diabetes treatment in the Arab region. The presence of phytoconstituents includes phenolic compounds, cis-geranyl acetone, benzenoids, monoterpenoids, sesquiterpenoids, hexanoic acid, nanoic acid. Most of the plants have medicinal properties; plants such as *Marsdeniataenacissima*, *Hemidesmu indicus*, *Cryptolepisbuchanani* and *Carallumaumbellata* are used in traditional medicines to treat some diseases, including asthma, cough, liver disorders and cancer. *D. corderoyi* is known for its use in appetite and stomach regulation. Methanolic extract is prepared by the maceration method. The dose of extract is 200mg/kg/day and 400mg/kg/day is administered to diabetic rats, and the result is a reduction of cholesterol, triglycerides and LDL and an increase in HDL. Streptozotocin-induced diabetic rats are used [20].

Ficus dalhousiae:

It belongs to the family moraceae. These are very rare species, found in the Nilgiri mountains and also the plant seen in moist deciduous forests, endemic to the southern western ghats. The fruit part is used for cardiotonics and leaves and bark are mainly used for liver and skin diseases. Leaf juice possesses antidiarrheal activity. Roots are antispasmodic. The preliminary phytochemical evaluation of *F. dalhousiae* bark extract showed the presence of coumarins, flavanoids, steroids and tannins. Methanolic extract is prepared by the Soxhlet apparatus. A dose of extract of 250 and 500mg/kg is administered to triton WR-1339 and High-fat diet-induced rats had reduced TC, TG,

LDL-C and HDL-C levels and the extract inhibited the synthesis of cholesterol. The high-fat diet-hyperlipidemic rats' method is used [21].

Teucrium takoumitense:

It belongs to the family Lamiaceae. This is an endemic plant that grows in a very limited area in the village of Tazougart in the Errachidia region. It is used for several disorders, including cardiovascular disease and disorders related to oxidative stress. Phytochemical analyses include total phenolic, total flavonoid, hydrocinnamic acid, coumarins, free quinones, terpenoids, saponins and tannins. It is used to treat anti-oxidants and hyperlipidemia. Aqueous extract is prepared by decoction. A dose extract of Aqueous Extract of *Teucrium Takoumitense* (AETT) of 250mg/kg is administered to triton WR-1339 rats to induce acute hyperlipidemia and result in a reduction in lipid levels. Triton WR-1339 induces hyperlipidemia in rats [22].

Sapindus mukorossi garten:

It is found throughout India and belongs to the Sapindaceae family. It is commonly known as Ritha or Aritha. It is used in excessive salivation, epilepsy and chlorosis. Saponins from this plant are known to be spermicidal. The spermicidal property has been used in contraceptive cream. Phytochemical analysis measures the presence of alkaloids, carbohydrates, saponins, flavanoids, anthocyanins and tannins. Hydroethanolic extract is prepared by the cold percolation method. A dose of extract (SM) of 500mg/kg is administered to streptozoin-induced diabetic rats, resulting in decreased total cholesterol and LDL cholesterol. The diabetic rat method with streptozotocin is used [23].

Solanum anomalum:

It belongs to the family Solanaceae and they are found growing in the west and east African subregions. Various parts of *S. anomalum*, a medicinal plant, are used locally in southern Nigeria for the management of diabetic conditions. It is used to treat diabetes, gastrointestinal disorders, infections, inflammation and pain. *Solanum* species contain steroidal alkaloids, steroidal saponins, flavonoids, lignans, and terpenes. Fruits have antidiabetic properties and are anti-inflammatory and leaf extracts have antioxidant and anti-ulcer properties. Ethanolic leaf extract is used in the method. A dose of 140mg/kg of extract was administered to an alloxan-induced diabetic rat and reduced TG, TC, LDL, and VLDL.

The alloxan-induced diabetic rat method is used [24].

Striga orobanchioidesbenth:

It is a member of the Scrophulariaceae family and naturally occur in Africa, Australia and Asia and they are used as antiandrogenic, antibacterial, antihistaminic and mast cell stabilising agents. It is used for the treatment of diabetes, as reported in Ayurveda, a traditional medicine. It shows the presence of alkaloids, tannins, glycosides, carbohydrates, proteins and flavanoids. The whole plant is extracted with ethanol in a solvent extractor for complete extraction. Benzyl: ethyl acetate (5:5) fraction described as SEBEF and ethyl acetate: methanol fraction of the ethanolic extract (SEEMF). Doses of extract 50 and 100mg/kg (SEBEF, SEEMF) are administered to streptozotocin-induced diabetic rats, and they reduce diabetes and bad cholesterol. The streptozotocin-induced diabetic rat method is used [25].

SyzygiumpaniculatumGaretn:

It is a member of the Myrtaceae family. Moreover, the fruits of *Syzygiumpaniculatum* (SP) are edible and used in ethnobotanical practices for treating chronic diseases like cancer, diabetes and cardiovascular disorders. *Syzygiumpaniculatum* is also known by the name 'smagenta cherry, Magenta lillypilly and Brush cherry. The presence of triterpenes, proteins, steroids, alkaloids, carbohydrates, flavonoids and phenol. It is used for diabetics without scientific evidence. SP fruits powdered were used to prepare different solvent extracts like hexane, ethyl acetate and methanol extracts by Soxhlet extractors. 100mg/kg bw (body weight) of fruit aqueous extract of *Syzygiumpaniculatum* (FAESP) is administered to streptozotocin-induced diabetic rats and they reduce TC and TG. The diabetic method is induced by streptozotocin [26].

III. CONCLUSION:

In conclusion, this Review mainly focused on antihyperlipidemic activity which exerted by the various easily available and effective phytoconstituents samples. In this study. We reviewed the research works showed promising results given by the sample. Which is taken as a base for various research works to overcome the emerging resistance shown by conventional antihyperlipidemic drugs.

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