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Assessment of Anti-Obesity Activity of Tramarindus Leaves on Butter Induced Hyperlipidemmia in Mice

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Abstract:

Obesity is one of the world's leading problems, which is major cause of Cardiovascular Diseases. During covid- 19 pandemic many young children and all age group people are getting challenged by obesity due stagnant life style. To treat such life threatening disorder natural remedies acquire prior position, Plant produce a good deal of secondary metabolites which have a benifited mankind in various ways, including treatment of disesses The present research work was focused on developing a natural remedy using *Tamarindus indica*,, an ancient plant with number of proven activities in Treditional medicine. In the literature survey, it was found that flavanoids, sterols, tannins and alkaloids shown promising effects to tackle obesity by various mechanisms, *Tramarindus indica* has shown the presence of sapponins, flavanoids, glycosides, amino acids, alkaloids. With the above evidence, this plant has been selected for screening of its antiobesity activity against high fat diat induced obesity in mice. Studies were conducted using aqueous extract of *Tamarindus indica* leaves (AETI) on high fat diet (butter) induced model of hyperlipidemia in mice. During 21 days time period AETI low and high doses were induced to respective animal groups along with butter where Atorvastatin has been taken as standard drug. Butter enhanced the Cholesterol and triglyceride, LDL levels. At the end of 21 days blood samples were collected from the animal through retroperitoneal route. Biochemical parameters of AETI have been revealed its antiobesity activity.

Key words: obesity, AETI, high fat diet, antiobesity, Atorvastatin.

Introduction:

According to WHO overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese[1]. Overweight and obesity are major risk factors for a number of chronic diseases, including cardiovascular diseases such as stroke, diabetes and its associated conditions including blindness, limb amputations, and the need for dialysis, musculoskeletal disorders including osteoarthritis. Obesity is also associated with some cancers, including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney and colon. The risk of these non communicable diseases increases even when a person is only slightly

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overweight and grows more serious as the body mass index (BMI) climbs. WHO defines over weight as a BMI equal to or more than 25, obesity as a BMI equal to or more than 30.

Statins are a class of prescription medicines that have been used for decades to lower low density lipoprotein (LDL-C) cholesterol in the blood.[2] Medicines in the statin class include atorvastatin, flustatin, lovastatin, pitavastatin, pravastatin, rosuvastatin and simvastatin.

Atorvastatin is a high efficacy and one of the most widely used lipid lowering medication.[3,4] The efficacy and safety of Atorvastatin have been testified by more than 200 randomized controlled trails , with most sufficient clinical evidence among all statins.[5] Atorvastatin is a reversible and competitive inhibitor of 3- hydroy-3- methylglutaryl – coenzyme A reductase, decreaseing the denovo cholesterol synthesis[6], has been selected as standard drug for the present research.

Plant produce a good deal of secondary metabolites which have a benifited mankind in various ways, including treatment of disesses.[7] Tramarindus indica belongs to the family Fabaceae and sub family Detarioideae. The plant has been used for centuries as amedicinal plant, fruit part of the plant has been more valuable, have often been reported in several pharmacopoeias. Leaves of the plant have good levels of proteins, fat, fiber and some vitamins such as thiamine, riboflavin, nicin, ascorbic acid, B- carotene.[8] The leaves have proven hepatoprotective activity[9] , antimicrobial activity[10], antifungal[11-14], antiseptic[11-14] , wound healing activity[15], anti emetic activity[16], antihistaminic activity[17], ect.

In the literature survey, it was found that flavanoids, sterols, tannins and alkaloids shown promising effects to tackle obesity by various mechanisms, [18] Tramarindus indica has shown the presence of sapponins, flavanoids, glycosides, amino acids, alkaloids. With the above evidence, this plant has been selected for screening of its antiobesity activity against high fat diat induced obesity in mice.

Materials And Methods:

Plant material collection and authentication:

The plant material of Tamarindus indica leaves used for the investigation was collected from A M Reddy Memorial College Of Pharmacy premises, Narasaraopet, Guntur Dt. The plant was identified and authenticated by P.SATYANARAYANA RAJU Department of botany from Acharya Nagarjuna University, Nagarjuna Nagar, Guntur, 522510, Guntur Dt, Andhra Pradesh.

Preparation of extract:

The leaves of Tamarindus indica were collected and shade dried at room temperature and grinded coarsely before extraction. The leaves were extracted by hot maceration by using distilled water. The resulting extract was collected into air tight container. Thus, the prepared extract was used for further pharmacological evaluation.

Experimental Animals:

Healthy male adult albino mice stains 20- 30 gms were selected for the study, obtained from Hyderabad. The animals were housed properly under 12:12 hours light and dark cycle and fed with proper food and water. National CPCSEA guidelines were strictly followed and all the studies were approved by the Institutional animal ethical committee.

Priliminary phytochemical evaluation:

The aqueous extract of *Tramarindus indica* leaves were subjected to preliminary phytochemical analysis to assess the presence of various phytoconstituents. It revealed the presence of sapponins, flavanoids, glycosides, amino acids, alkaloids. All these tests were performed at A.M.Reddy Memorial College of pharmacy, Narasaraopet, Guntur,Andhra Pradesh.

Obesity Inducer:

For the present study Butter was mainly used to induce obesity in animals. 400 mg of butter /kg body weight dissolved in 10ml of buffered saline was administered.

Test drug preparation:

The two doses of test **(**AETI low dose and high dose)and Standard drug Atorvastatin are soluble in water, so were dissolved in distilled water and admministerd to the respective animal groups per oral. All the test concentrations were prepared freshly before administring to the animals.Butter was administerd after 30min of test drug administration to all groups.

.Animal groups:

Group-1 was considered as control group which received only the vehicle.

Group-2 was considered as the high fat diet group which received the butter.

Group-3 was considered as first testing group and received the test extract that is aqueous extract of *Tramarindus indica (*AETI*)* 250 mg per kg weight per oral along with butter.

Group-4 was considered as second test group and received the test extracts that is aqueous extracts of *Tramarindus indica (*AETI*)* 500mg per kg weight per oral along with butter.

Group-5 was considered as standard group which received the standard drug atorvastatin (10mg/ kg) along with butter.

Body weight:

Body weight of the animals was recorded every week before administering of the test drugs.

Sample collection: At the end of 21st day blood was collected from the retro orbital plexus after overnight fasting and then was centrifuged and the serum was obtained and was estimated for the total cholesterol, LDL,VLDL,HDL.

Biochemical Parameters: On the 21st day of the methodology, that is after the last test drug administration, the mice were anesthetized with Diethyl ether and the blood samples were collected from retro orbital puncture using capillary tube into clotting tubes. Serum samples were analysed at Jayanti laboratory at Jayanti Hospital, Palnadu Road, Vinukonda, Guntur, Andhra Pradesh.

Results:

Table No.1: preliminary photochemical tests

S.NO	Photochemical tests	Inference
1	Test for alkaloids	+ve
2	Test for flavonoids	+ve
3	Test for glycosides	+ve
4	Test for amino acids	+ve
5	Test for saponins	+ve

Table Number.2: Effect of Tamarindus indica on bio-chemical parameters

S .No Groups	Total cholesterol (mg/dl)	Triglycerides (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
1 group I (control)	156±1.56	112.0±49.58	62.0±1.58	90±44	25±1.45
2 group II (butter induced)	244.50±1.48	360.0±1.60	41.0±1.62	170±1.75	78.16±1.68
3 group III (AETI 0.5ml)	200.90±1.58	190±1.60	44±1.58	110±1.68	37±1.60
4 group IV (AETI 1 ml)	181±1.26	166.0±1.48	58.0±1.58	87±1.67	33±1.25
5 group V (std atorvastatin)	161.50±1.94	162.54±1.58	38.48±1.41	120±0.60	41±1.53

Discussion:

Obesity is the major and health problem in India and developing countries, which lead to important risk factors like atherosclerosis, stroke etc. Obesity increases the likelihood of other diseases. Obesity evokes the damages in various tissues, which in turn, deregulate the cellular functions leading to damage t o various pathological conditions.

Atorvastatin is a high efficacy and one of the most widely used lipid lowering medication.[3,4] The efficacy and safety of Atorvastatin have been testified by more than 200 randomized controlled trails , with most sufficient clinical evidence among all statins.[5] Atorvastatin is a reversible and competitive inhibitor of 3- hydroy-3- methylglutaryl – coenzyme A reductase, decreasing the denovo cholesterol synthesis[6], regulate LDL, VLDL-C levels has been selected as standard drug for the present research.

In the literature survey, it was found that flavanoids, sterols, tannins and alkaloids shown promising effects to tackle obesity by various mechanisms, [19] *Tramarindus indica* has shown the presence of sapponins, flavanoids, glycosides, amino acids, alkaloids. With the above evidence, this plant has been selected for screening of its anti obesity activity against high fat diet induced obesity in mice.

High cholesterol is also referred to as hypercholesterolemia. Cholesterol is a fatty substance that is important part of the outer lining of cells in the body of the animals. Cholesterol is also found in the blood circulation of humans. It is also a precursor for the synthesis of steroid hormones. High levels of cholesterol can increase the risk of heart disease. Cholesterol is synthesized in all animal tissue. Increased amount of cholesterol leads to cardiovascular diseases particularly coronary heart disease (CHC)[20]. Total Cholesterol levels of AETI high dose were recorded as 181±1.26 and standard drug shown 161.50±1.26, in general controlling of cholesterol by AETI 161±1.26 is said as good reduction.

Triglycerides are a type of fat in the blood stream and in fat tissue. These are small enough to enter into the arterial wall and thus have the potential to accumulate and cause atherosclerosis.[21-23] Looking at TG level of both AETI and standard drug are almost similar 166.0±1.48 and 162.54±1.58, here just 4 points difference was observed.

HDL-C are inversely correlated with clinical events resulting from atherosclerosis, instead HDL protects against cardiovascular disease by regulating cholesterol efflux from tissue and modulating inflammation [24]. **In** case of HDL-C, AETI 58.0±1.58 could not reach the value of Standard drug 38.48±1.41. So the study was

ensuring to lower the HDL-C of AETI in a protecting way.

LDL is a risk factor and places a role at several steps of atherosclerosis. LDL is called low density lipoprotein because LDL particles tend to the less dense than other kinds of cholesterol particles. Increase in evidence as revealed that the concentration and the size of the LDL particles more powerfully relates to the degree of atherosclerosis progression than the concentration of cholesterol contained within all the LDL particles. Perhaps, it was observed that tha test drug AETI 87±1.67 is able to bring down the LDL level very much than standard drug 120±0.60

VLDL (very low density lipoprotein) transports cholesterol and triglycerides within the body, and are associated with increased risk of coronary heart disease. It was observed good reduction in VLDL level with AETI (33±1.25) than standard drug 41±1.53.

Conclusion:

In congruence with these results, it may be confirmed that due to thepresence of phytoconstituents such as sapponins, flavanoids, glycosides, amino acids, alkaloids in the aqueous extract, it could be responsible for the observed significant anti-obesity activity. So, the present study proven that the aqueous extract of *Tramarindus indica* leaves exhibited significant Anti-obesity activity.

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