

ANTIHYPERLIPIDEMIC AND HEPATOPROTECTIVE ROLE OF *ECLIPTA ALBA* IN HIGH FAT DIET INDUCED HYPERLIPIDEMIC ALBINO RATSSATHEESH NAIK K^{1*}, GURUSHANTHAI AH M², NAGESH RAJU G³, LOKANADHAM S⁴, SESHADRI REDDY V⁵¹Department of Anatomy, Bharath University, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India.²Department of Anatomy, Basaveshwara Medical College, Chitradurga, Karnataka, India. ³Department of Pharmacology, Basaveshwara Medical College, Chitradurga, Karnataka, India. ⁴Department of Anatomy, Santhiram Medical College and Hospital, Nandyal, Andhra Pradesh, India. ⁵Department of Biochemistry, Maheshwara Medical College and Hospital Medak, Telangana, India.

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ABSTRACT

Objective: Eclipta Alba has been used in traditional and folklore medicine to treat Hyperlipidemia and hepatic disorders. The present study was aimed to investigate the Antihyperlipidemic and hepatoprotective potentials of Eclipta Alba in high fat diet -induced Albino rats and to determine the underlying mechanism.

Methods: A total of 30 adult albino rats of Wistar strain weighing 165–215 g were utilized. Animals were treated with high fat diet for 8 weeks followed by post-treatment of *E. alba* for 1 week, 2 weeks, and 3 weeks, respectively. After 12 h of fasting on the last day of experiment, serum blood samples were collected in EDTA vials and processed for biochemical analysis.

Results: A significant decrease in levels of total cholesterol and triglycerides was noted on animals treated with *E. alba* compared to high fat diet animals. Treatment of hypercholesterolemic rats with *E. alba* showed a marked decrease of serum low-density lipoprotein (LDL) and very LDL-cholesterol concentrations compared to the hypercholesterolemic rats. High fat diet feeding worsened the levels of serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, and alkaline phosphatase enzymes, whereas the same markers were significantly improved by supplementation with *E. alba* compared to normal group.

Conclusion: *E. alba* acts as antihyperlipidemic agent in hyperlipidemic conditions and helps for better health.

Keywords: Serum, High fat diet, *Eclipta alba*.

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INTRODUCTION

Hyperlipidemia has been known to promote oxidative stress leading to the development of coronary artery diseases, atherosclerosis, and other obesity-associated complications [1]. Atherosclerosis is a condition that involves the interplay of several factors such as oxidation of lipoproteins and atherosclerotic plaque formation [2]. Elevated levels of serum triglycerides (TG), cholesterol, and low-density lipoprotein (LDL) are major risk factors for the development of cardiovascular diseases such as atherosclerosis, hypertension, and coronary heart disease [3]. Increased plasma lipid levels mainly total cholesterol (TC), TG, and LDL along with a decrease in high-density lipoprotein (HDL) are known to cause hyperlipidemia [4]. Eclipta alba (Asteraceae) is an annual herbaceous plant, commonly known as false daisy. It is an erect or prostrate, much branched, roughly hairy, annual, rooting at the nodes; the leaves are opposite, sessile, and lanceolate. Main active principles consist of coumestans such as wedelolactone, desmethylwedelolactone, furanocoumarins, oleanane, and taraxastane [5,6]. The root stem and leaves of *E. alba* were analyzed for steroids such as diosgenin, tigogenin, and lanosterol [7]. Eclipta prostrata is a binominal husk of *E. alba*. *E. alba* is one of the most widely used plants in Ayurvedic formulations for the liver and is said to be the best drug for the treatment of liver ailments such as cirrhosis and infective hepatitis and other conditions involving hepatic enlargements. *E. alba* has a folk reputation in rural Southern India as hypoglycemic agent [8]. The present study was undertaken to study the antihyperlipidemic activity of *E. alba* against high fat diet-treated animals.

METHODS

A total of 30 adult albino rats of Wistar strain weighing 165–215 g were utilized from animal house of the Basaveshwara Medical College,

Hospital, and Research Centre, Chitradurga, for the present study. The rats were maintained in the laboratory under controlled environmental conditions (12 h light/dark cycle and room temperature [22–24°C]) and humidity (50±5%), and rats were housed in polypropylene cages and given food and water *ad libitum*. Group I: Animals fed with normal diet (Control); Group II: Animals treated with hyperlipidemic diet for 8 weeks; Group III: Animals treated with hyperlipidemic diet for 8 weeks, followed by 1 week post-treatment of *E. alba* with normal diet; Group IV: Animals treated with hyperlipidemic diet for 8 weeks followed by 2 weeks post-treatment of *E. alba* with normal diet; and Group V: Animals treated with hyperlipidemic diet for 8 weeks followed by 3 weeks post-treatment of *E. alba* with normal diet. After 12 h of fasting on the last day of experiment, all the animals were anesthetized using chloroform and serum blood samples were collected in plane and EDTA vials by heart puncture, and then, animals sacrificed. The blood samples were processed for biochemical analysis. The present study has clearance with the Institutional Animal Ethical Committee of Basaveshwara Medical College and Hospital 04/06/2015 and BMCH/IAEC/01 Anat/2015.

Preparation of hyperlipidemic diet

For 1 kg of diet, carbohydrate 520 g, proteins 180 g, fats 300 g, 2% NaCl, and 1% multivitamins were taken [9].

Statistical analysis

All the data obtained were statistically analyzed for any significant differences of various parameters studied between groups by the one-way analysis of variance followed by a Tukey's *post hoc* analysis. $p < 0.05$ has been considered to be statistically significant. Statistical analysis was performed using the MEDCALC software.

RESULTS

There was a significant decrease in the TC and TG levels in animals treated with *E. alba* compared to their high fat diet controls (Fig. 1).

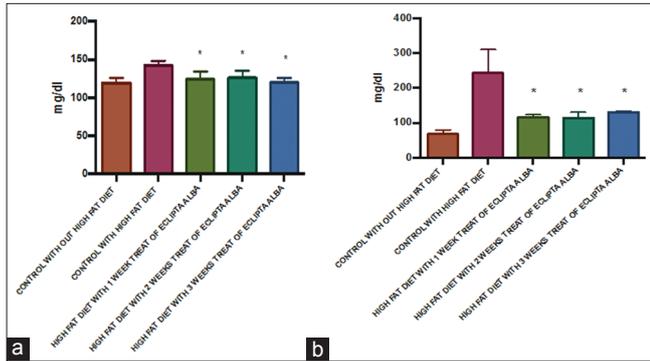


Fig. 1: (a and b) Total cholesterol and triglycerides of animals from different groups

Plasma TC, LDL, and very LDL (VLDL) levels were increased in animals treated with high fatty diet, but no significant difference was observed in the levels of HDL in the animals treated with high fat diet. Treatment of hypercholesterolemic rats with *E. alba* showed a marked significant decrease of serum LDL and VLDL-cholesterol concentrations compared to the hypercholesterolemic rats (Fig. 2).

High fat diet feeding worsened the levels of serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), and alkaline phosphatase (ALP) enzymes which are major metabolic enzymes in the liver. The levels of these markers were significantly improved by supplementation with *E. alba* when compared to normal group (Fig. 3).

DISCUSSION

The atherogenic diet-induced hyperlipidemic model followed by treatment of the aqueous leaf extract of the *E. prostrata* showed significantly reduced TC, TG, and total protein and observed a significant elevation in the HDL-cholesterol levels [10]. Biherbal ethanolic extract from the leaves of *E. alba* and seeds of *Piper longum* at a dose level of 50 mg/kg body weight was administered orally once for 14 days which restored elevated serum

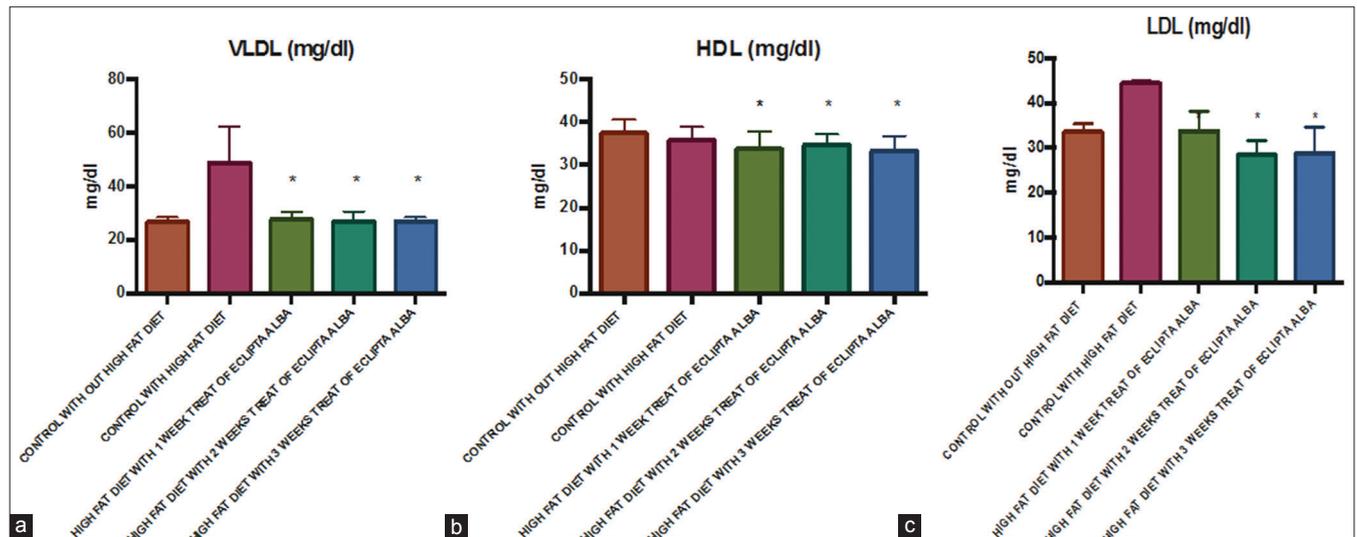


Fig. 2: Hyperlipidemic rats treated with Eclipta alba in different groups (a-c) Treatment of hypercholesterolemic rats treated in different groups (parameters such as very low-density lipoprotein, high-density lipoprotein, and low-density lipoprotein)

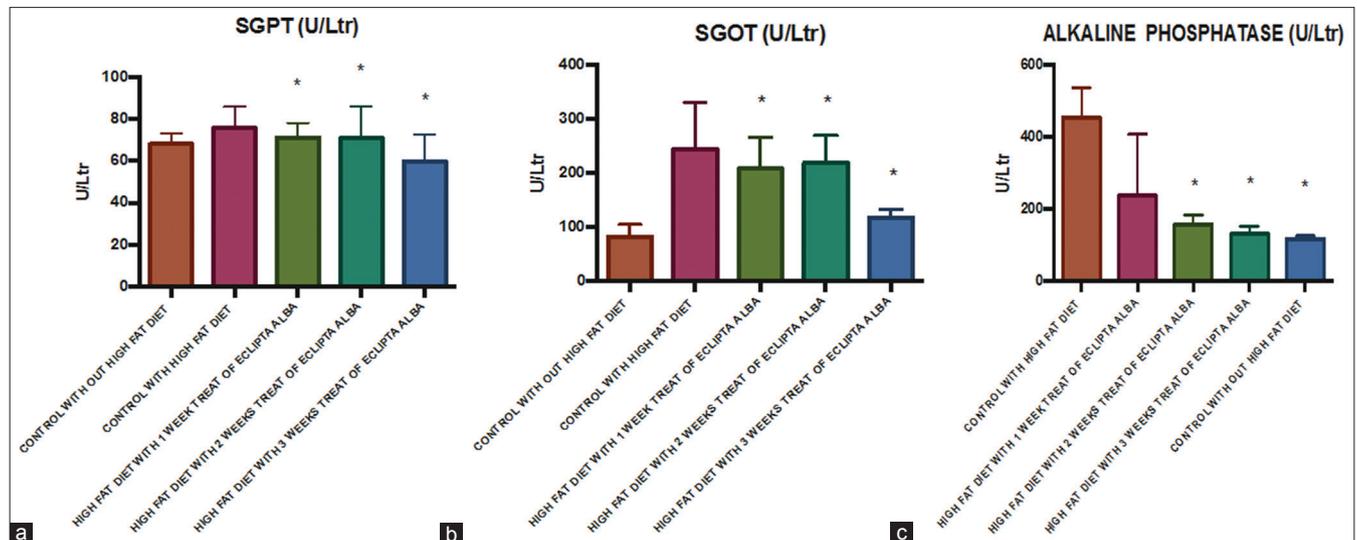


Fig. 3: Effects of Eclipta alba on liver enzymes in different treatment groups (a-c) (serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, and alkaline phosphatase levels)

marker enzymes such as SGOT, SGPT, ALP, LDH, acid phosphatase, gamma-glutamyl transferase, and 5'-nucleotidase, due to CCl₄ treatment [11]. All the biochemical parameters such as total protein, total bilirubin, TC, TG, and urea were also restored toward normal levels [12,13]. Hepatoprotective activity of the methanolic extract and subfractions of leaves and the chloroform extract and subfractions of roots of *E. alba* was carried out using carbon tetrachloride-induced liver damage and lysosomal enzyme level in Wistar albino rats. The methanolic extract of leaves and the chloroform extract of roots of *Eclipta alba* showed significant activities (P<0.01) and (P<0.05) respectively causing 72.8% & 47.96% reduction of lysosomal enzyme. The Coumestan fraction and Triterpenoidal Saponins fraction from the chloroform extract of roots produced very significant (P<0.01) (75.6%) and (P<0.05) (52.41%) respectively reduction of carbon tetra chloride induced increase in lysosomal enzyme levels in blood [14]. Albino rats fed with High fat diet supplemented with freeze-dried butanol fraction of *E. prostrata* per kilogram of diet for 6 weeks reported a significant reduction of serum triacylglycerol, TC, and LDL-cholesterol levels and elevation in the HDL when compared with the normal diet fed animals [15]. Leaf Extract of *Eclipta alba* administered orally in alloxan-induced diabetic rats resulted in a reduction in blood glucose level, glycosylated hemoglobin due to decreased activity of glucose-6 phosphatase and fructose 1, 6-bisphosphatase, and increased activity of liver hexokinase stated that oral administration of *Eclipta alba* extract possesses potent antihyperglycemic activity [16]. *E. alba* scientifically and clinically proved to possess antidiabetic and diuretic activity by acting on the pancreas by restoration and regeneration of pancreatic β -cell activity [17]. The findings of present study in agreement with previous literatures and also stating that antihyperlipidemic and Hepatoprotective properties of *Eclipta alba* by reducing the serum biomarkers and metabolic enzymes in high fatty diet treated animals.

CONCLUSION

E. alba has potential effects on hyperlipidemia, reduces the higher levels of lipid markers, and acts as antihyperlipidemic agent for better health.

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AUTHORS' CONTRIBUTIONS

The corresponding author has collected the data and written the manuscript.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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