EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 3
Issue: 11
463-468
Year: 2016

EFFECT OF ARTEMISIA AFRA ETHANOLIC EXTRACT ON GLUCOSE AND LIPIDS PROFILE IN DIABETIC AND HYPERLIPIDEMIC ALBINO RATS.

Raghda Abdalbage Abdalla[1], Maysa Mahmoud Omer[2], Laila E. Taha[3], Alneil M. Hamza[4], Salih Abdelgadir Elmahdi[5] and Abdalla Eltoum Ali*[6]

[1,2,3]Biochemistry department, Central laboratories, Alzaiem Alazhari University (AAU), Sudan.
[4]Clinical Laboratories Sciences Department, College of Applied Medical Sciences, AlJouf University, Saudi Arabia
[5]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, The National Ribat University, Sudan.
[6]Clinical chemistry department, Faculty of Medical Laboratories, Alzaiem Alazhari University (AAU), Sudan.

***Corresponding Author: Dr. Abdalla Eltoum Ali**
Clinical chemistry department, Faculty of Medical Laboratories, Alzaiem Alazhari University (AAU), Sudan.

Article Received on 12/09/2016 **Article Revised on 21/10/2016** **Article Accepted on 01/11/2016**

ABSTRACT

Background: Medicinal plants are used in a wide range in Sudan to treat several disease. *Artemisia afra* is a herb widely used in Africa to treat many diseases specially diabetes. **Aim:** this study aimed to assess the effect of *Artemisia afra* ethanolic extract on blood glucose and lipids Profile in dexamethasone induced diabetic and hyperlipidemic wistar albino rats. **Method:** Forty two males wistar albino rats were used, divided into four groups (N=6). Group (1) considered as negative control. Dexamethasone (10 mg/kg .S.C) for 10 days is used to induce hyperglycemia and Hyperlipidemia in groups (2, 3 and 4), marked increase in glucose, serum lipids is absorved, group(2) considered as the positive control. From day 11 to day 30 groups (3, 4) had been administered with different doses (200 - 400mg/kg-b.w) of the Artemisia afra plant respectively, fasting blood samples were collected for estimation of glucose and lipids profile. **Results:** Diabetic rats showed marked significant decrease ($p \leq 0.05$) in blood glucose when treated with the ethanolic extract of both doses. Cholesterol significantly reduced by (64%) at dose (200mg/kg) and (74%) at dose (400mg/kg). Hypertriglyceridemia in the treated groups seems to be not affected by either doses when compared to negative group, which reduced by (24% and 0.5%) at (200 mg/kg and 400mg/kg) respectively ($p=0.461$) ($p=0.463$) respectively. Group (4) of Dose (400 mg/kg) had shown best result on LDL which significantly reduced by (70%) compared to group (3) of dose (200mg/kg) which significantly reduced LDL by (57%) ($p \leq 0.05$). HDL is significantly reduced by (55%) at (200 mg/kg) and (79%) by (400 mg/kg) ($p \leq 0.05$). **Conclusion :** The Artemisia afra ethanolic extract shows significant effectively reduce the blood glucose, total cholesterol, triglyceride and low density lipoprotein (LDL), and very useful therapeutic agent for treating and management diabetes and Hyperlipidemia.

KEYWORDS: Diabetes mellitus, Hyperlipidemia, Cholesterol, Triglycerides, High density lipoprotein, Low density lipoprotein, Artemisia Afra.

INTRODUCTION

Diabetes mellitus is highly recognized as the most common metabolic and endocrine disorder worldwide. It is linked to disturbances in carbohydrate, fat, and protein metabolism.[1] Its especially important because the global prevalence of diabetes is projected to escalate relentlessly. At least 250 million individuals worldwide suffer from diabetes and this number will be doubled by 2030. Hyperlipidemia or hyperlipoproteinemia, refers to the excess status of fatty substances including cholesterol, triglycerides or lipoproteins in the bloodstream.[2] Hyperlipidemia is an important risk factor in developing heart disease and stroke which are leading causes of death in most developed countries.[3]

According to the World Health Organization (WHO) report, around four billion people (80% of the world´s population) use herbal medicine.[4] *Artemisia Afra* is a common species of the genus *Artemisia* in Africa. *Artemisia afra* is the only indigenous species of 400 species in the genus.[5] Is considered as an important medicinal plant species with high content of essential oils and flavonoids (leaves and stems).[6] Its known of treating metabolic and Endocrine System Disorders specially Diabetes.[7]

So in this study we aimed to explore the effect of ethanolic extract of *Artemisia afra* on glucose and lipids.

MATERIAL AND METHODS

Plant Materials

Dry mature *Artemisia afra* (whole plant) used in this study was obtained from local herbal market in Omdurman (Sudan), and it has been recognized by a botanist Prof. The dried plant materials were milled using mortar. The powder obtained was used for extraction.

Preparation of ethanolic extract

Extraction was carried out according to methods described by (Harbarone).[8] six hundred grams of plant sample were soaked in 2.5 liters of 80% ethanol for 3 days. Solvent was evaporated under reduced pressure using rotary evaporator apparatus. Extract was exposed to air till complete dryness and the yield was (98.663 g).

Animals

Twenty four rats of either sex weighing (130-160g) and aged three months was obtained from faculty of pharmacy, university of Khartoum, Sudan. Animals housing and protocol approved by the pharmacology laboratory of Medicinal and Aromatic Plants Research Institute, National centre for Research, Khartoum, Sudan. The animals were acclimatized for seven days before being used; rats were housed in groups in stainless steel cages access to water and fed.

Induction of diabetes and Hyperlipidemia

Induction was done by administration of (10mg/kg.bw) of Dexamethasone to rats for 10 days subcutaneously.[9][10]

Preparation of Treated Doses

Doses of *Artemisia afra* ethanolic extract were calculated for each rat individually, according to its body weight. Doses were administration to the rats orally using oro-Gastric feeding tube.

Treatment experiment

All rats were kept for seven days in the animal's house under controlled conditions of temperature (25+1˚C), as a period of adaptation. All rats were allowed to feed and water freely, animals were divided into four groups (N=6) Group one, was left untreated (negative control group) and was fed a standard normal diet. Groups 2 (positive control), group 3 and 4 were the case groups, the three previous groups given standard normal diet, and injected with dexamethasone 10 mg/Kg body weight subcutaneously for 10 days. Only those rats whose fasting blood glucose levels and lipids profile were higher than those of the negative controls were utilized for further study. From day 11 to day 30 Groups 3 and 4 were treated (200 mg/ kg in one ml D.W) and (400 mg/ kg in one ml D.W) of an ethanolic extract of *Artemisia afra* respectively. Blood samples were collected from all rats at days 10, 20 and 30 for the determination of glucose and lipids profile.

Statistical analysis

The data were expressed as mean ± standard error mean (S.E.M). The Significance of differences between the groups was assessed using one way and multiple way analysis of variance (ANOVA). The test followed by Dunnett's test p values less than 0.05 were considered as significance.

RESULT

As shown on (Figure 4.1)(Table 4.1), after administration of dexamethasone positive control had increased compared to negative control , both doses (200 and 400 mg/kg) of the plant in group 3 and 4 at days (20,30) showed significant decrease (p=0.00), (p=0.00) respectively, in comparative to positive control, (Figure 4.1). Dose (400mg/kg) showed intensive hypoglycemic effect at day 30, so dose (200mg/kg) recommended to avoid hypoglycemia.

Total cholesterol levels in positive group have increased compared to negative group this indicates hypercholesteremia. In the groups treated with (200mg/kg) & (400mg/kg) the values are reduced significantly at days (20 and 30) compared to day 10 and positive control (p= 0.00),(p=0.00) respectively, (Table 4.1), (Figure 4.2). But for more specification in dose (400mg/kg) cholesterol levels became more near to the negative group (Figure 4.2).

The triglyceride levels have reached high levels in Dexamethasone induced groups (2,3 and 4) compared to negative group. The two groups treated with *A. Afa* wasn't show observable change from positive control at both days (Table 4.2), (Figure 4.3). However insignificant decrease was showed at dose **(**200mg/kg) (p=0.461), at dose (400kg/kg) (p=0.463).

In Dexamethasone induced groups (2,3 and 4) LDL have significantly increased compared to negative group at day 10 (Figure 4.4). Both doses (200mg/kg and 400mg/kg) at days (20 and 30) shows significant decrease when compared to positive control (p=0.033) (p=0.025) respectively, (Table 4.2), (Figure 4.4), generally dose 400mg/kg show results closer to negative control so it's the recommended dose for LDL.

In group tow (positive control) HDL levels was higher than group one (negative control), in groups (3 and 4) HDL was higher than the positive control at day 10, after administered of (200mg/kg and 400mg/kg) of *A.Afra* in groups (3 and 4) respectively HDL became higher than positive and negative control at (day 20), then became slightly near to negative control and significantly decreased from positive control at day 30 (p=0.00) (p=0.044) respectively. (Table 4.2), (Figure 4.5).

Table (4.1) Effect of Artemisia Afra ethanolic extract on glucose and Cholestrol Levels are expressed as mean±S.E, Significant at (p<0.05)

Groups	Glu/Day10	Glu/Day20	Glu/Day30	P.value	Chol/ Day10	Chol/Day20	Chol/Day30	P.value
Negative control(G1)	79.21±19.7	80.65±23.37	72.6±20.02	-	69.5 ± 20.65	60.66 ± 26.22	61.5 ± 14.23	-
Positive control(G2)	209.33 ± 52.45	254.33 ± 77.36	250.33±45.7	-	292.33 ± 5.84	400.83± 54.66	365 ± 96.68	-
Ethanolic extract 200mg/kg (G3)	202.33 ±45.58	121.5 ± 28.63	89.33±33.82	0.00	337.17 ± 71.59	161.5 ± 56.73	121.7 ± 33.04	0.00
Ethanolic extract 400mg/kg (G4)	230.83 ± 72.19	111.2 ± 27.3	68.83 ± 20.8	0.00	285.7 ± 49	175.3 ± 33.96	67.5 ± 26.41	0.00

Table(4.2) Effect of Artemisia Afra ethanolic extract on Triglyceride, LDL, HDL Levels are expressed as mean±S.E, significant at (p<0.05)

Groups	Tri/Day10	Tri/Day20	Tri/Day30	P.value	LDL/ Day10	LDL/Day20	LDL/Day30	P.value	HDL/ Day10	HDL/ Day20	HDL/ Day30	P.value
Negative control(G1)	87.3 ± 32.49	80.3 ± 52.87	89.3 ± 40.45	__	39.7 ±17.04	36.6 ± 8.28	45.1 ± 20.64	__	25.7±14.89	30.7±7.76	33.5±6.31	__
Positive control(G2)	269.3 ± 61.25	319 ± 97.48	328.8 ±70.07	__	163.9±25.9	185.5 ±32.8	229.5 ±44.04	__	47.4±13.28	40.4± 15.15	46.8±15.24	__
Ethanolic extract 200mg/kg (G3)	366.7 ±29.62	321 ± 46.44	275.5 ±18.92	0.461	159.6 21.57	97.4 ±35.36	69.3±20.61	0.033	45.5±20.33	49.2±29.05	20.7±9.95	0.00
Ethanolic extract 400mg/kg (G4)	340.5 ±76.8	283 ± 103.2	342.5 ±84.69	0.463	164± 23.9	82.5±41.9	49.8± 20.33	0.025	75±23.3	62.7±26.05	16.7±8.59	0.044

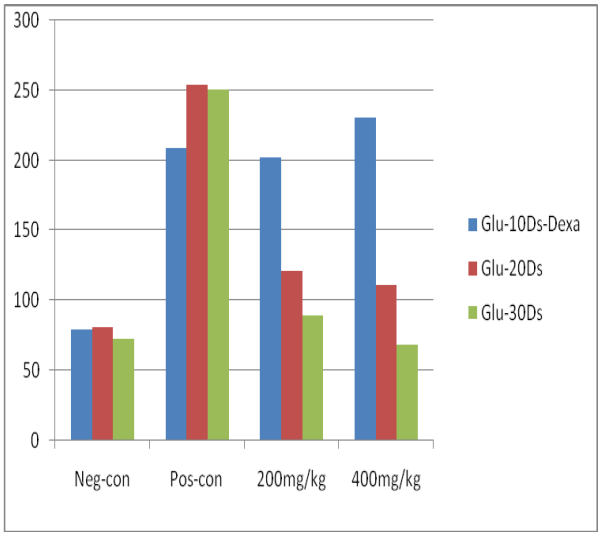


Figure (4.1) Effect of *Artemisia Afra* ethanolic extract on glucose

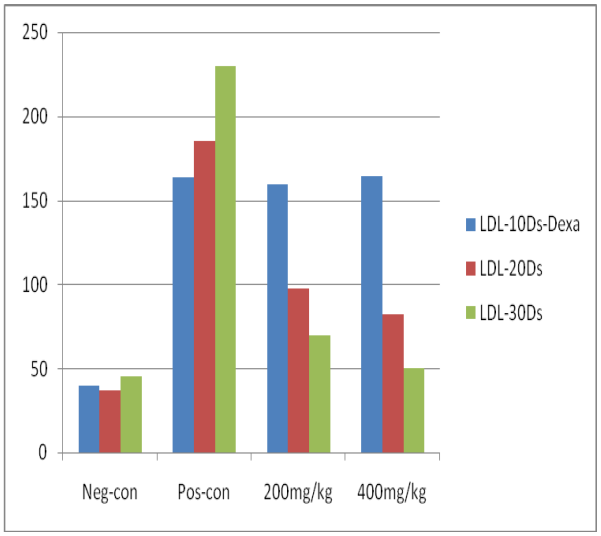


Figure (4.4) Effect of *Artemisia Afra* ethanolic extract on LDL

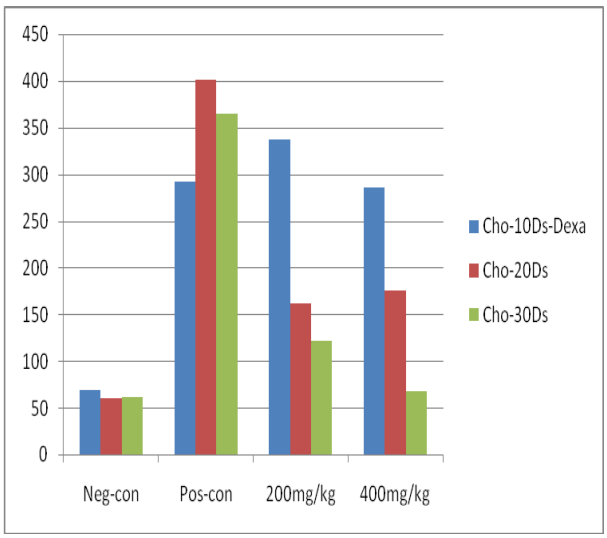


Figure (4.2) Effect of *Artemisia Afra* ethanolic extract on Cholesterol

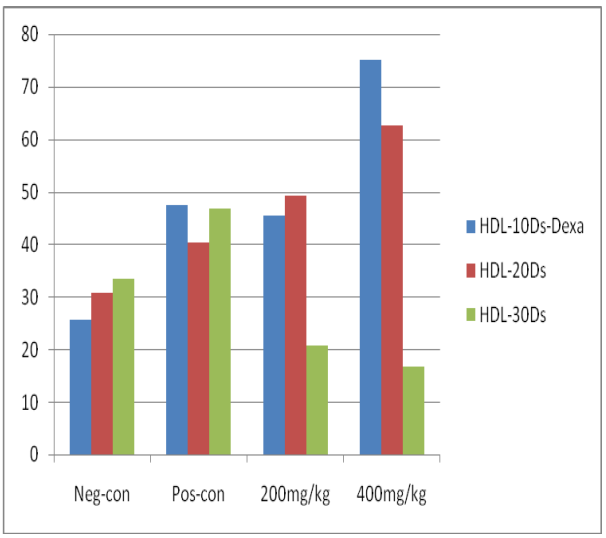
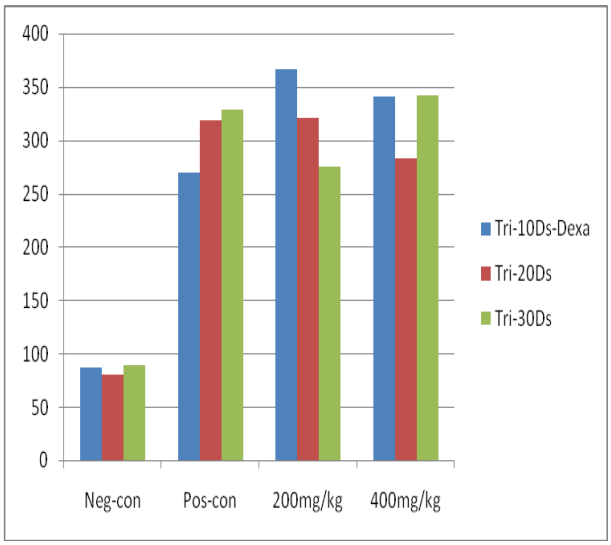


Figure (4.5) Effect of *Artemisia Afra* ethanolic extract on HDL



Figure(4. 3) Effect of *Artemisia Afra* ethanolic extract on Triglycerides

DISCUSSION

In recent years much attention has been focused on using medicinal plants as an alternative therapy for treatment of many diseases including diabetes mellitus and Hyperlipidemia. Plants reduce hyperglycemia either by induce insulin secretion or by improve the utilization of glucose by the cells or regenerate pancreatic cells by their antioxidant agents.

Also have a dislipidemic agents which reduce the imbalance of lipids.

In the present study we aimed to evaluate the efficacy of *Artemisia afra* ethanolic extract on glucose and lipids profile in diabetic and hyperlipidemic albino rats.

Ethanolic extract of *A.afra* at both doses (200,400 mg/kg b.w) show significant decrease on glucose levels by (56% and 70% respectively) ($p \leq 0.05$) in dexamethasone induced Diabetic rats. This agreed with previous study

carried out by Idris[11] . who stated that the tested plant have the ability to eliminate free radicals and regenerate pancreatic cells **.**

Our finding also confirmed by Anthony[12]. who revealed that *A.Afra* hypoglycemic activity attributed to saponin content which elevates insulin secretion by regeneration of pancreatic β-cells .

Our finding also supported by Wittle et al.[13] who studied the effect *Artemisia* spp extracts (*A.Afra* included) and he found that it contains active ingredients having glucagon antagonist properties which enhance hypoglycemia. In present study hypoglycemic effect of *Artemisia afra* ethanolic extract is in agreement with Afolyan.[14] who submitted that *A. afra* extract produced significant hypoglycemic effect in diabetic rats by increasing metabolic activity and glucose metabolism also he attributed the hypoglycemic effect of the plant to saponin presence.

In the present study ethanolic extract of *A. afra* was significantly able to bring down the levels lipids levels in hyperlipidemic induced groups when compared to the untreated group. Cholesterol significantly reduced by (64%) at dose (200mg/kg and (74%) at dose 400mg/kg . Hypertriglyceridemia in the treated groups seems to be not affected by either doses when compared to untreated group, which reduced by (24% and 0.5%) at 200 mg/kg and 400mg/kg respectively, (p=0.461) (p=0.463) respectively. Dose 400 mg/kg had shown best result on LDL which significantly reduced by (70%) compared to dose 200mg/kg which significantly reduced LDL by (57%) ($p \leq 0.05$). Instead of elevation we see that HDL is significantly reduced by (55%) at (200 mg/kg) and (79%) by (400 mg/kg) ($p \leq 0.05$).

Previous studies which examined the hypolipidemic effect of *A.Afra* as a complication of diabetic induce in rats agreed with Taofik [15] who confirm that *A.Afra* can reduce elevation of lipids associated with diabetes mellitus.

Our study agreed with T.O. Sunmonu [16] who admitted that *A.Afra* attenuated lipid peroxidation and decrease the imbalance in lipid specially in the heart, also agreed with Bobotas et al. [17][18] who made a dislipidemic therapy (Tablets) from a combination of many compounds including *A.Afra.*

CONCLUSION

In conclusion, findings obtained from this study revealed that *Artemisia Afra* can act as effective hypoglycemic and hypolipidemic agent, dose 400mg/kg showed the most significant results specially on lowering glucose, cholesterol and LDL than the dose 200mg/kg . On the other hand dose 200 mg/kg more reduced triglycerides and Lesley HDL.

REFERENCES

1. Moore H, Summerbell C, Hooper L, Cruickshank K, Vyas A, Johnstone P, Ashton V, Kopelman P(2004): Dietary advice for treatment of type 2 diabetes mellitus in adults. The Cochrane database of systemic reviews.,2: 43-50.
2. Jain KS, Kathiravan MK, Somani RS, Shishoo CJ. The biology and chemistry of Hyperlipidemia Bioorg Med Chem., 2007; 15(14): 4674-99.
3. Castilla-Guerra L, Fernandez-Moreno Mdel C,Alvarez-Suero J. Secondary stroke prevention in the elderly: new evidence in hypertension antihyperlipidemia. Eur J Intern Med., 2009; 20(6): 586-90.
4. Ghasemi DN: Pharmacopia of Iranian plants, First Edition, Isfahan. Ministry of Health and Medical Education.Deputy of Food and Medicine, 2002.
5. Bremness, L. *The complete book of herbs*, Dorling Kindersley, London, 1988.
6. Woerdenbag HJ, BosR, Salomons MC, Hendriks H, Pras N and MalingreTh M(1993):Volatile constituents of *Artemisia annua*L. (*Asteraceae*). Flav. and Frag. J., 8: 131-13.
7. Van Wyk B-E, Van OB, Gericke N. Medicinal plants of South Africa 2nd ed. Tien Wah Press, Singapore, 2000; 44-46: 58.
8. Harborne JB. Phytochemical methods: a guide to modern techniques of plant analysis. (3rd ed.) London: Chapman & Hall, 1998. ISBN: 0-412-57270-2, 302.
9. Pragda *et al*, Int J Ayurveda Res., Apr-Jun, 2010; 1(2): 100–102. doi: 10.4103/0974-7788.64396 *Int J Pharm Pharm Sci.*, 2012; *4(4): 279-283.*
10. Akhila J Shetty, Divya Choudhury, Rejeesh, Vinod Nair, Maria Kuruvilla, Shashidhar Kotian. September 16, 2010. IP: 202.141.47.165.
11. Idris Ahmed Issa1 and Mohammed Hussen Bule2, Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine, 2015, Article ID 752486.
12. Anthony Jide Afolayan and Taofik Olatunde Sunmonu. Biosci. Biotechnol. Biochem., 2011; 75(11): 2083-2086.
13. Whittle BA, Skett PG Pharmaceutical compositions and methods for the manufacture thereof. Assigned to Phytotech Limited, The University Court of the University of Glasgow, Patent Cooperation Treaty Application, European Patent No. WO97035598, 1997.
14. Afolayan, Anthony Jide; Sunmonu, Taofik Olatunde, January 2013, African Journal of Traditional, Complementary & Alternative Medi., 2013; 10; 15.
15. Taofik O. Sunmonu and Anthony J. Afolayan Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine, 2013, Article ID 929074, pages http://dx.doi.org/10.1155/2013/929074.
16. T.O. Sunmonu ,A.J. Afolayan' Phytomedicine Research Center, Department of Botany, University

of Fort Hare, Alice 5700, South Africa, July 2010; 48(7): 1969–1972.
17. Bobotas G, Rongen Roelof, ML, Fawzy A, Kling D (2008) CB1 Antanogist and a dyslipidemic agent and/or metabolic regulator, and methods of making and using same, Assigned to Reliant Pharmaceuticals, Inc., Patent Cooperation Treaty Application. European Patent No. WO08115574.
18. Gayathri V. Patil1*, Sujata K. Dass2 and Ramesh Chandra, J Pharmacogenom Pharmacoproteomics, 2011; 2: 3. http://dx.doi.org/10.4172/2153-0645.1000105.