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"Hypoglycaemic effect of Berberis vulgaris L. in normal and Alloxan -induced diabetic rats"

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Abstract

Diabetes mellitus is a metabolic disorder characterized by glycosuria, hyperglycemia, and negative nitrogen balance sometime ketonemia. Resulting either inadequate secretion of insulin, an inadequate response of target cells to insulin, or combination of these factors. Insulin deficiency is due to functional disorder of the pancrease .Diabetes is a group of symptoms caused by high blood sugar and changes in lipid, carbohydrate and protein metabolism that increase the risk of vascular disease. More than 400 herbs have been reported to have hyperglycemic effects, but only some of them have been studied. Although there are many medications to control diabetes, they also have some side effects. The plant is reported to have laxative, antiasthmatic, antihelminthic, headache, antiseptic and anti-inflammatory properties. The aim of this study was to investigate the anti-diabetic effect of plant roots extract in alloxan-induced diabetic rats. Recognition of antidiabetic drugs is related to many biochemical parameters. Berberis vulgaris L is famous in the Ayurvedic system roots of medicine and is used to treat many ailments. The plant is reported to have laxative, antiasthmatic, antihelminthic, headache, antiseptic and anti-inflammatory properties. This study aimed to investigate the anti-diabetic effect of plant roots extract on alloxan-induced diabetic rats. Recognition of antidiabetic drugs is related to many biochemical parameters.

Key word:
Anti-diabetic drugs, Anti-diabetic screening, Diabetes, Hyperglycemia, methanolic roots extract, Berberis vulgaris L

INTRODUCTION

Diabetes Mellitus is a metabolic disease caused by glycosuria, hyperglycemia and sometimes negative nitrogen balance (ketonemia). It may cause insulin deficiency, target response to insulin, or a combination of these conditions. Berberis vulgaris L is a popular name in the Ayurvedic system roots of medicine and is used to treat many ailments. The plant is reported to have laxative, antiasthmatic, antihelminthic, headache, antiseptic and anti-inflammatory properties. The aim of this study was to investigate the anti-diabetic effect of plant roots extract in alloxan-induced diabetic rats. Recognition of antidiabetic drugs is related to many biochemical parameters.

Materials and methods

Plant collection and identification

Roots of Berberis vulgaris L were collected from the Punjab. It is recognized by the Department of Botany, Gov girls college, Chhatarpur, M.P.. Shortly after harvest, the roots are washed and dried in the shade. After drying, these roots are crushed into a coarse powder and stored in plastic containers for later use.

Phytochemical Analysis

Macroscopic analysis of fresh plant material was performed to check its properties. Extraction process Extraction can be defined as the treatment of plant or animal tissue with a solvent in which the active ingredients are dissolved by chemical process and most of the chemicals cannot remain. The solvent used for extraction is called solvent, and the inert and insoluble substance remaining after extraction is called residue. Extractions are performed using a variety of techniques. Evaluation of antidiabetic activity Diabetes is a disease caused by severe glucose metabolism and poor fat and protein metabolism. Controlling diabetes without side effects remains a medical challenge. This has led to increased demand for natural products with anti-hyperglycemic properties and some side effects. Ancient texts describe many medicinal plants that contain many minerals and nutrients important in the treatment of diabetes.

Induction of Diabetes

Diabetes was induced in male albino rats administered alloxan monohydrate. Animals were fasted for 24 hours and injected intraperitoneally with freshly prepared sterile sanitary solution of alloxan monohydrate at a dose of 150 mg/kg body weight. Blood glucose measurements 24 hours after alloxan monohydrate confirmed that this dose was sufficient to induce diabetes in animals. In these animals, diabetic symptoms persisted for 21 days. Rats with hyperglycemia (>250 mg/dL) were selected for the study. 0 animal deaths

Blood collection

If you are not killing the animal, cut off its tail and take a small amount of blood from the tail.

Measurement of level of serum blood sugar

Blood taken from the veins is used to measure blood sugar. When bleeding begins, bring the animal closer to the pulse glucose meter and allow the fluid to flow onto the test strip. Turn on the pulse glucose meter and allow the test to be performed with blood. After a few seconds, the blood sugar value appears on the screen.

Collection and centrifugation of blood

After the experimental protocol, blood was collected by retroorbital puncture under light chloroform anesthesia, and the blood was collected and centrifuged at 2500 rpm. The collected fluid was used for biochemical tests. Scientific Analysis Statistical analysis was performed by one-way analysis of variance (ANOVA) and Dunnet's T test. Statistical significance was determined as $p<0.001$, $p<0.01$, $p<0.05$.

Results and Discussion

The table shows the glucose and total protein levels of rats in different groups. Compared with the normal control group, glucose levels were higher in rats in the alloxan control group ($p < 0.01$). However, blood sugar levels of diabetic rats administered EOB with extract were lower than control rats with alloxan ($p<0.01$). After re-administration of the extract for 21 days, blood sugar levels decreased in diabetic rats compared to

diabetic controls. There was found no significant difference between the normal control group and rats treated with using the extract alone. From the table, it is evidence that the blood sugar level of diabetic mice without EOB treatment increased and the roots extract could correct this metabolic change by controlling blood sugar because there was no significant difference from the normal control. In contrast, the extract has hypoglycemic activity but not hypoglycemic activity. Compared with the normal control, the total protein content of diabetic rats decreased ($p<0.01$), and the levels almost returned to normal after EOB treatment. There was no significant difference between normal control and EOB -treated mice treated with extract alone. Lipid profile levels of diabetic control, normal control and experimental mice are shown in the table. In alloxan-induced diabetic rats, blood triglycerides, cholesterol, phospholipids, LDL and VLDL cholesterol increased ($p < 0.01$), while HDL cholesterol decreased compared to normal controls. The plant extract used in the experimental study effectively reduced triglycerides, phospholipids, cholesterol, LDL and VLDL cholesterol and increased HDL levels ($p < 0.01$).

Table 1: Effect of Roots extract of *Berberis vulgaris* on Serum Glucose level of control and experimental rats

GROUPS	TREATMENT	BLOOD GLUCOSE LEVEL(mg/dl)				
		INITIAL	At 0th day	At 5th day	At 10th day	At 15st day
Group-I	NORMAL (1 ml 0.9 % N.S)	106.33± 2.33	104.66±2.741	104±1.96	103.66±1.94	104.16±2.30
Group-II	CONTROL (Alloxan 150 mg/kg)	109.33± 2.33	281.16±2.50	287.5±2.23	286.5±2.34	283.66±2.45
Group-III	STANDARD (Glibenclamide 10 mg/kg)	106.66± 3.52	294.5±2.75	259.66±3.46	214.83±4.34**	144.5±4.09**
Group-IV	*EOB* 250mg/kg + Alloxan	111.00± 2.30	287±4.33	272.16±3.01 ns	224.16±2.61*	174.83±2.67**
Group-V	*EOB* 500mg/kg + Alloxan	112.00± 1.15	289.83±4.40	261.31±1.93*	204.5±1.91**	158.42±2.09**
Group-VI	*AOB* 250mg/kg + Alloxan	109.42±2.33	284.66±4.11	279.16±4.47ns	266.83±2.77 ns	234.33±4.05 ns
Group-VII	*AOB* 500mg/kg + Alloxan	107.35±3.21	288.66±5.69	275.16±3.75 ns	258.33±3.57 ns	221.14±3.47*

Table 2: Effect of Roots extract of ***Berberis vulgaris*** on ,Triglycerides, Cholesterol,Phospholipids, of control and experimental rats

Groups	**Cholesterol (mg/dl)**	**Triglyceride (mg/dl)**	**Phospholipids (mg/dl)**
Normal control (2 ml normal saline)	180.2 ± 1.15	127.49 ± 0.94	9.27 ± 0.35
Diabetic control (150 mg/kg Alloxan & 2ml NS)	238.7 ± 2.9	152.38 ± 2.5	12.27 ± 0.55
Diabetic rat given EOB (250 mg/kg)	215.2 ± 1.4**	142.88 ± 1.2*	10.93 ± 0.36*
Diabetic rat given EOB (500 mg/kg)	190.6 ± 0.99*	130.38 ± 0.91**	8.68 ± 0.41**
Diabetic rat given GLB (10 mg/kg)	185.08 ± 1.79**	126.24 ± 1.85**	11.02 ± 0.13**

Table 3: Effect of Roots extract of *Berberis vulgaris* on serum LDL HDL, and VLDL of control and experimental rats

Groups	**HDL (mg/dl)**	**LDL (mg/dl)**	**VLDL (mg/dl)**
Normal control (2 ml normal saline)	53.28 ± 1.8	101.42 ±1.6	25.5 ±1.5
Diabetic control (150 mg/kg Alloxan & 2ml NS)	33.71 ±1.2	164.56 ± 1.8	30.48 ±1.4
Diabetic rat given EOB (250 mg/kg)	37.09 ±1.6*	148.61 ± 0.8**	25.58±1.8**
Diabetic rat given EOB (500 mg/kg)	45.09±1.8**	119.37± 1.5**	26.08±2.5*
Diabetic rat given GLB (10 mg/kg)	48.21 ±1.18**	110.62 ± 1.1**	24.25±2.6**

Effect of Roots extract of *Berberis vulgaris* on ALP, SGOT and SGPT of control and experimental rats

GROUPS	ALP (IU/L)	SGOT (IU/L)	SGPT (IU/L)
Normal control (2 ml normal saline)	285.26 ± 2.63	34.16 ± 0.80	41.76 ± 0.49
Diabetic control (150 mg/kg Alloxan & 2ml NS)	552.76 ± 1.71**	71.52 ± 0.52**	88.52 ± 1.88**
Diabetic rat given EOB (250 mg/kg)	371.54 ± 1.16**	62.36 ± 0.89**	73.00 ± 1.58**
Diabetic rat given EOB (500 mg/kg)	283.60 ±2.26ns	35.12± 2.88ns	40.35 ± 1..54ns
Diabetic rat given GLB (10 mg/kg)	358.12 ± 0.82**	56.37 ±1.60**	68.53 ± 1.42**

CONCLUSION

The table shows the glucose and total protein levels of mice in each group. Compared with the normal control group, the blood sugar values of the rats in the alloxan control group were higher ($p<0.01$). However, blood sugar values of diabetic rats given EOB extract were lower than control rats given alloxan ($p<0.01$). After repeated administration of this extract for 21 days, blood sugar levels of diabetic rats reduced comparison with diabetic controls. There was found no significant difference between normal control and EOB-treated rats when extract alone was used. It has been shown that blood sugar increases in diabetic mice without EOB, and the roots extract can correct metabolic changes by controlling diabetes because there is no significant difference between blood sugar with normal control. It does not have anti-hyperglycemic or hypoglycemic activity. Compared with the normal control group, the total protein content of diabetic rats decreased ($p < 0.01$), and the levels almost returned to normal after EOB treatment. There was no significant difference between normal control and EOB-treated rats when extract alone was used. Blood lipid levels of normal control, diabetic control and experimental mice are shown in the table. In alloxan-induced diabetic rats, serum cholesterol, triglycerides, phospholipids, LDL and VLDL cholesterol increased ($p < 0.01$), while HDL cholesterol decreased compared to normal controls. The plant roots extract used in research experiments has been shown to effectively reduce triglycerides, cholesterol, phospholipids, LDL and LDL cholesterol and increase HDL levels ($p < 0.01$).

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