Polyherbal antidiabetic drug: An approach to cure diabetes

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ABSTRACT

In recent years, diabetes has become a major health concern. India is referred to as the diabetes capital of the world. There are plenty of chemical agents available to monitor and treat diabetic patients, but up to this date, no complete recovery from diabetes has been recorded. Many herbal plants with hypoglycemic properties are known from around the world as an alternative to these synthetic agents; which is a natural remedy to keep the blood sugar under control by consuming vegetables & herbs in our diet. Such medicinal plants & their herbal preparation with proven antidiabetic and related beneficial effects were used in the treatment of diabetes in rats. The effect of polyherbal drug Anti-hyperglycemic activity is studied in rats against alloxan-induced diabetes. This polyherbal drug consists of 16 antidiabetic plants. Disorders in diabetes-induced glucose metabolism have been shown to be regulated. The present study was conducted in the Dept. of Pharmacology and Dept. of Biochemistry at Central Animal House Facility of the SBH Govt Medical College, Dhule, in collaboration with Datta Meghe Medical College, (Datta Meghe Institute of Medical Sciences Sawangi, Meghe) Nagpur, Maharashtra, India. After the treatment, fasting blood glucose, plasma insulin and glycosylated hemoglobin (HbA1c) were determined in normal and experimental rats. Polyherbal mixture was seen to be an effective and safe method for management of diabetes which reduces blood sugar levels & shows positive effect in altering blood glucose levels. The herbal formulation could be lowering the insulin resistance, thereby normalizing the uptake of glucose by cells.

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INTRODUCTION

Diabetes mellitus is a metabolic disorder which is characterized by hyperglycemia, hyperlipidemia, and hyperinsulinemia and is due to a decrease in insulin, secretion and its action. Increases in platelet indices are shown to be linked with diabetes and its complications, statistically. These are readily accessible, fast, quick, non-invasive, and easy to interpret method for determining platelet dysfunction, and in turn, predict microvascular complications (Kumar et al., 2019).

In recent years, diabetes has become a major health

concern. India is referred to as the diabetes capital of the world (Jarald *et al.*, 2008). The International Diabetes Federation projected 642 million diabetics worldwide before 2040 (Patel *et al.*, 2012). In India, the prevalence of diabetes is estimated to be 8.7 % (International Diabetes Federation, 2017). At present, the allopathic medicines for diabetes include acarbose, insulin and various oral antidiabetic agents such as biguanides, sulfonylureas α-glucosidase inhibitors and glinides, which are costly and not easily available (Chaudhury *et al.*, 2017).

Diabetes is an endocrine disease that influences the metabolism of the body and results in structural changes affecting vascular system organs. Severe diabetes complications include coronary heart disease, stroke, retinopathy, renal failure and neuropathy. Diabetes is a result of Beta-cell destruction of the pancreatic islet typically due to an autoimmune reaction that results in insulin deficiency requiring exogenous insulin to avoid serious complications. Persons with diabetes must have blood sugar management by diet with hypoglycemic or herbal medicine (Sitholay *et al.*, 2017).

Diabetes is the multifactorial and multi-targeted disease. All patients with diabetes associated with tuberculosis should be treated for diabetes stabilisation, whether pulmonary or extrapulmonary. Insulin should initially be given before diabetes stabilizes (Saxena and Vikram, 2004). Such biomarkers have a critical role in decision-making on diagnosis, therapy and prognosis, particularly in the context of the insufficient quantitative risk assessment available to clinicians (Cladius *et al.*, 2017).

Herbal drugs should be comparatively healthier than conventional medications such as metformin, sulfonylureas etc. and can be used in the management of prediabetes and prevention of further progression of diabetes. Hence, this research aimed to see the impact of the polyherbal drug on anti-hyperglycemic activity against diabetes caused by alloxan in rats. (Ambad and Jha, 2020; Prince *et al.*, 2004; Dhanabal *et al.*, 2006) This polyherbal drug consists of 17 antidiabetic plants Which have been demonstrated to control diabetes-induced glucose metabolism disorders. All these herbal preparations are known as antidiabetic drugs and are used by all ayurvedic practitioners (Efird *et al.*, 2014; Kanetkar *et al.*, 2007).

MATERIALS AND METHODS

Study Area

The present study was conducted in the Dept. of Pharmacology and Central Clinical Laboratory (Dept. of Biochemistry) at Central Animal House Facility of the SBH Govt Medical College, Dhule, in collaboration with Datta Meghe Institute of Medical Sciences Sawangi, Meghe, Wardha and Datta Meghe Medical College, Nagpur, Maharashtra, India.

Wistar rats of either sex were used and weighed between 160-200 g. The animals were lodged under normal laboratory conditions, kept on natural light and dark schedule, and had free access to food and water. Before the experiments, the animals were acclimatized to laboratory conditions. All experiments took place between 09.00 and 15.00 hrs. The experimental procedures have been approved by the Institutional Ethics Committee and carried out for the use and treatment of laboratory animals according to the Indian National Science Academy Guidelines.

Drugs

Alloxan (Loba Chemie, Bombay), Metformin (Panacea Biotec., Lalru (Pb). (Mf).

Induction of Diabetes

Diabetes was induced in the animals by a single injection of alloxan monohydrate (150 mg/kg, i.p.). It was confirmed after 48 hours (on the third day). Animals found hyperglycemic were divided into different groups.

Study group

The rats were divided into seven groups after the induction of alloxan diabetes. Five rats were used in each group. An aqueous solution of the drug was prepared by adding 10 gm powder of the polyherbal mixture (PHM) in 100 ml. The solution was blended in cyclomixer, boiled for 15 minutes. Cooled and filtered (PHMaq). Treatment was given for 30 days.

Table 1 shows the group distribution according to drugs. Group I and II are normal control, and Group III, IV, V, VI and VI are diabetic groups received a different type of treatments.

Sample Processing

A blood sample was used to analyze the biochemical parameters. 5 ml of blood was obtained from the subject and handled in dry disposable syringe under aseptic conditions and transferred for biochemical analysis to a clean, dry and acid-washed vial. Samples were allowed to clot at room temperature, centrifuge it at 4500 -5000 rpm for 30 minutes and serum was processed for analysis of blood sugar, Plasma insulin and HbA1c

Biochemical Investigations

Parameters were assessed immediately using the following method:

Table 1: Group of rats and treatment

Group	Rats	Treatment	Name
I	Normal	2 ml saline	Normal control
II	Normal	PH Maq 0.25 g/kg BW	Drug control
III	Diabetic	2 ml saline	Diabetic control
IV	Diabetic	PH Maq 0.05 g/kg BW	Low drug level
V	Diabetic	PH Maq 0.1 g/kg BW	Med drug level
VI	Diabetic	PH Maq 0.2 g/kg BW	High drug level
VII	Diabetic	(Mf) 500 μg/kg BW	Antidiabetic

Table 2: The blood glucose and Plasma insulin level in all groups

Groups	Blood glucose	Plasma Insulin	HbA1c
I	99 ± 14.5	12 ± 2.5	6.05 ± 0.45
II	60 ± 9.7	11 ± 1.3	6.04 ± 0.32
III	156 ± 32.4	15 ± 2.8	6.03 ± 0.41
IV	132 ± 18.6	13.5 ± 1.9	5.82 ± 0.21
V	111 ± 28.7	14.2 ± 1.1	5.98 ± 0.53
VI	97 ± 16.7	12.2 ± 0.8	5.91 ± 0.33
VII	75 ± 9.9	13.7 ± 1.4	5.89 ± 0.29

Table 3: Comparison of Group III with IV, V, VI

Group	Blood glucose	P value	Plasma Insulin	P value	HbA1c	P value
III	156 ± 32.4		15 ± 2.8		6.03 ± 0.41	
IV	132 ± 18.6	0.188	13.5 ± 1.9	0.35	5.82 ± 0.21	0.33
V	111 ± 28.7	0.04	14.2 ± 1.1	0.59	5.98 ± 0.53	0.87
VI	97 ± 16.7	0.006	12.2 ± 0.8	0.06	5.91 ± 0.33	0.62

Blood glucose estimation is done by GOD-POD method (Davis *et al.*, 1978).

Estimation of Plasma Insulin was assessed by ELISA kit method (Kit purchased from Ray Biotech company) (ELR-Insulin , 2016).

HbA1c was estimated by HPLC method (Ambade *et al.*, 1998).

Statistical analysis

Microsoft Excel Worksheet was entered for the data obtained. One particular group of rats was allocated to one specific category of drug addiction, and each group was composed of five rats (n=5). The data were analyzed using the "t" test of unpaired (2-tailed) student. P-value < 0.05 (0.01) at a confidence interval of 95 per cent will be regarded as statically important (highly significant).

RESULTS AND DISCUSSION

Table no 2 shows the concentration of blood glucose, plasma insulin and HbA1c in all groups. The concentration of glucose in all group I, II, III, IV, V, VI, VII were 99 ± 14.5, 60 ± 9.7, 156 ± 32.4, 132 ± 18.6, 111 ± 28.7, 97 ± 16.7 and 75 ± 9.9 respectively. The concentration of plasma insulin were 12 ± 2.5, 11 ± 1.3, 15 ± 2.8, 13.5 ± 1.9, 14.2 ± 1.1, 12.2 ± 0.8, 13.7 ± 1 and HbA1c level were 6.05 ± 0.45, 6.04 ± 0.32, 6.03 ± 0.41, 5.82 ± 0.21, 5.98 ± 0.53, 5.91 ± 0.33, 5.89 ± 0.294 in Group I, II, III, IV, V, VI, VII respectively.

Group IV, V, and VI were compared with group III (diabetic). It was observed that there was a statistically significant reduction in blood glucose levels in group V and VI. Plasma insulin levels were improved in all the group, but it was not statistically significant. HbA1c levels were also decreased but were not statistically significant

After the treatment, fasting blood glucose, plasma insulin and glycosylated hemoglobin (HbA1c) were determined in normal and experimental rats.

In our Vedic literatures such as Charak Samhita which has already recorded the use of plants, herbs and their derivatives for diabetes mellitus care. More than 400 plants have been used in about 700

recipes used in the treatment of diabetes mellitus in nearly two-thirds of the world's population. A large number of in vivo studies had been performed on animals to test the hypoglycaemic activity using plants is described in the literature, and various medicinal plants have also been reported for their antidiabetic action (Chauhan *et al.*, 2010).

The present investigation indicated in Table 2 and Table 3 that the polyherbal drug mixture has shown a significant decrease in the blood glucose level as compared to the control group. The herbal formulation could be lowering the insulin resistance, thereby normalising the uptake of glucose by cells. The drug formulation did not have any significant effect on the glycosylated hemoglobin levels. The polyherbal herbal mixture containing 17 drugs used in this study have not previously been studied to see the effect on diabetes. The individual effect of the herbal drug has been studied to see the effect of these drugs on diabetes (Gaddam *et al.*, 2015; Stanely *et al.*, 2000). We conclude that the life-style adjustment system used in our studies such as Neurobics and Sanskar -Remodeling can be used along with routine in the management of diabetes (Sugihara *et al.*, 2000).

We believe that this is the first study to use a polyherbal mixture containing sixteen (16) herbs which were used to see their effect on diabetes with no adverse effects seen. The polyherbal mixture showed a positive effect in controlling diabetes among the rats. The above study had some limitations of having a small size of sample which restricted us from performing multivariate modelling & studying long term effect of the polyherbal mixture on diabetes. Also, due to a small blood sample, other parameters could not be able to perform. The above study shows that the polyherbal mixture can be used to decrease the blood sugar level.

CONCLUSION

Polyherbal mixture was seen to be an effective and safe method for management of diabetes which reduces blood sugar levels & shows positive effect in altering blood glucose levels. The herbal formulation could be lowering the insulin resistance, thereby normalising the uptake of glucose by cells. Thus, this herbal mixture can be tried on human. The drug formulation did not have any significant effect on the glycosylated hemoglobin levels.

Source of Funding and sponsorship

Nil

Conflicts of interest

Nil

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