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.

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).

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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 VII 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

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

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

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

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

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

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 Neurotics and Sanskar -Remodeling can be used along with routine in the management of diabetes (Sugi-hara 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

REFERENCES


