



Research Article

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EVALUATION OF HYPOGLYCEMIC EFFECT OF AN INDIAN FRUIT: *DILLENIA INDICA*

Das Munnee^{1*}, Sarma Bishnu Prasad²

¹Medical Officer, Health and Family Welfare Department of Assam, India

²Associate Professor, Department of Kayachikitsa, Government Ayurvedic College, Guwahati, Assam, India

Received on: 22/05/13 Revised on: 29/06/13 Accepted on: 17/07/13

*Corresponding author

E-mail: mdasaz@gmail.com

DOI: 10.7897/2277-4343.04418

Published by Moksha Publishing House. Website www.mokshaph.com

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ABSTRACT

The fruit of *Dillenia indica* has been an integral part of the Assamese cuisine and it is claimed that this fruit can control blood sugar when consumed on a regular basis. A randomized clinical trial was carried out on 40 patients in Government Ayurvedic College and Hospital, Guwahati, Assam, India. The study revealed the hypoglycemic activity of *Dillenia indica* in type 2 diabetes patients, following standardized approach. The fruit powder of *Dillenia indica* used in this trial showed significant hypoglycemic effect ($p < 0.001$). The result of the clinical trial has been highly encouraging with the mean blood sugar both FBS and PPBS of the patients being reduced gradually overtime without any unwanted effect.

Keywords: Diabetes mellitus, *Dillenia indica*, Hypoglycemia.

INTRODUCTION

An attempt has been made through this study to explore the rich and vast wealth of ethno medicinal and traditional knowledge in the North East especially in the state of Assam, India. In the study efficacy of the trial drug *Dillenia indica* as oral hypoglycemic agent in type 2 diabetes mellitus was studied. The fruit of *Dillenia indica* is used traditionally by the people of Assam, India in Assamese cuisine and is a folk remedy for type 2 diabetes¹. The trial drug is described in major Ayurvedic texts². The *Dillenia indica* species is native to Southeast Asia from India to Bangladesh, Sri Lanka, Southwest China, Thailand and Malaysia³. The tree grows up to 40 feet tall. The leaves are oblong, serrated, glabrous and appearing with flowers. The sepals and petals are 5 in number; peduncles solitary, terminal and single flowered. The seeds are hairy and carpals are joined into a spurious, many celled, many seeded berry which is crowned by radiant stigmas. Flowers are large and showy with white petals and yellow anthers. The fruit is a 5-12 cm diameter aggregate of 15 carpals. When ripe the fruits are greenish yellow in color, are succulent and have sweet smell^{2,4}. The Genus *Dillenia* has 60 species of which *Dillenia indica* is the most common edible species of the family Dilleniaceae. The physic-chemical and phytochemical characters of the fruit proper are total ash %- 4.453, acid soluble ash (%)- 4.150, tannins (%)- 1.2 and reducing sugar (%)- 3.44^{5,6}.

MATERIALS AND METHOD

Open non-comparative trial was done with fruit powder of the trial drug *Dillenia indica* to explore and study its efficacy in the management of type 2 diabetes mellitus as an oral hypoglycemic agent and to study the adverse effect of the drug. The trial drug was collected from area around Azara in Kamrup district of Assam, India. The fruit was cut into pieces and shade dried. After drying for 7-10 days, it was made into powder and sieved. A total of 40 patients were selected for the clinical trial from the

OPD and IPD of Kayachikitsa Department, Government Ayurvedic College and Hospital, Guwahati 14, Assam, India. Selection was random but fully satisfied with the inclusion criteria. 19 male and 21 female patients were included in the study. The powder was given in the dose of 30 g daily in two divided doses, half an hour before lunch and dinner with warm water for 24 weeks along with advice for diet control and lifestyle modification. The patients were advised to come for follow up at 8th, 16th and 24th week. The results were assessed according to the change in parameters as per standard criteria. Statistical analysis was done using all values which are expressed as mean \pm SD and calculating the t-value of mean difference between before treatment and after every follow up. The results were assessed through 'p' value and paired 't' test. Blood glucose was measured by glucose oxidase method and HbA1c by ion exchange chromatography^{7,8}.

RESULTS

Among 40 cases of type 2 diabetes mean FBS level before treatment was 158 ± 16.1 and after treatment with the trial drug the mean difference in each follow up had increased gradually from 139.2 ± 8.1 at 8 weeks to 119.3 ± 4.1 at 16 weeks and 98.7 ± 1.1 at 24th week of treatment (Table 1). The mean difference in case of PPBS had increased gradually from 180 ± 5.6 to 168.45 ± 12.1 and 155.9 ± 16.7 at 8th, 16th and 24th weeks of treatment respectively (Table 2). The initial mean HbA1c was 8.7 and this was reduced to 6.8 after treatment (Table 3). Clinically no adverse effect was reported during this 24 weeks study.

DISCUSSION

The results after treatment show that the level of fasting blood glucose and post prandial blood sugar was significantly reduced upon treatment with the trial drug *Dillenia indica*, so the trial drug may have acted through some effect on insulin secretion and by decreasing glucose absorption from the GIT.

Table 1: Effect of Treatment on Fasting Blood Sugar (FBS) in 40 Cases of Diabetes Mellitus (type2)

| N = 40 | BT | FU1 | BT-FU1 | FU2 | BT-FU2 | FU3 | BT-FU3 |
|-----------|------------|-------------|-------------|-------------|-------------|------------|-----------|
| Mean ± SD | 158 ± 16.1 | 139.2 ± 8.1 | 18.3 ± 11.4 | 119.3 ± 4.1 | 38.2 ± 15.4 | 98.7 ± 1.1 | 58.8 ± 16 |
| SE | | | 1.8 | | 2.4 | | 2.5 |
| t value | | | 10 | | 16 | | 23.7 |
| P value | | | < 0.001 | | < 0.001 | | < 0.001 |

The effect of treatment on FBS is found to be statistically highly significant with P value being < 0.001

Table 2: Effect of Treatment on Post- Prandial Blood Sugar (PPBS)

| N = 40 | BT | FU1 | BT-FU1 | FU2 | BT-FU2 | FU3 | BT-FU3 |
|-----------|------------|--------------|-------------|------------|-------------|--------------|-------------|
| Mean ± SD | 212.7 ± 11 | 180.5 ± 10.8 | 32.1 ± 17.6 | 168.4 ± 12 | 44.2 ± 15.9 | 155.9 ± 16.7 | 56.6 ± 18.3 |
| SE | | | 2.79 | | 2.52 | | 2.89 |
| t value | | | 11.51 | | 17.55 | | 19.62 |
| P value | | | < 0.001 | | < 0.001 | | < 0.001 |

In case of post prandial blood sugar (PPBS) the effect of treatment on the PPBS is found to be statistically highly significant (P < 0.001)

Table 3: Effect of Treatment on Glycosylated Hemoglobin (HbA1c)

| N = 40 | MEAN ± SD | | | SE | t value | P value |
|--------|-----------|-----------|-----------|------|---------|---------|
| | BT | AT | BT-AT | | | |
| | 8.7 ± 1.0 | 6.8 ± 0.8 | 1.9 ± 0.7 | 0.11 | 17.2 | < 0.001 |

The level of Glycosylated hemoglobin (HbA1c) is found to be statistically highly significant after 24 weeks of taking the trial drug

As the level of Glycosylated hemoglobin was significantly reduced after taking the trial drug, we can say that upon treatment with the trial drug the subjects achieved good glycemic control. Thus the folkloric use of *Dillenia indica* for management of Diabetes mellitus is found to be effective and this drug may be consumed daily as a part of normal diet.

CONCLUSION

The results of the therapeutic trial showed that the trial drug *Dillenia indica* was very effective in controlling the blood glucose level. It needs to be mentioned that the trial drug needs further evaluation on large number of patients using different study designs. Because of its significant hypoglycemic effect it can prove to be very valuable as an oral hypoglycemic drug to manage Diabetes mellitus and its complications without the adverse effects of synthetic Oral Hypoglycemic Agents (OHA).

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Cite this article as:

Das Munnee, Sarma Bishnu Prasad. Evaluation of hypoglycemic effect of an Indian fruit: *Dillenia indica*. Int. J. Res. Ayurveda Pharm. 2013;4(4):545-546 <http://dx.doi.org/10.7897/2277-4343.04418>

Source of support: Nil, Conflict of interest: None Declared