Research Article

ANTI-HYPERGLYCEMIC EFFECT OF *KUNDRU* (*COCCINIA INDICA*) ON PATIENTS OF DIABETES MELLITUS TYPE-2

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ABSTRACT

The disease Diabetes or *Madhumeha* is well documented in all perennial sources of Ayurvedic wisdom. The present study was done to evaluate the efficacy of *Bimbi* (*Coccinia indica*) in the patients of Diabetes mellitus type-2 through single blind study. Total 30 patients were selected and divided into two groups, 15 patients in each group i.e., A (*Bimbi*) & B (Barley). In this study it has been found that *Madhumeha* affects not only in elderly people but in adults too with slight female preponderance. The present study confirmed that after the treatment of 60 days, *Bimbi* (*Coccinia indica*) was found effective in treatment of *Madhumeha* and reduced majority of the symptoms of illness that including *Prabootha mootrata* (Excessive urination), *Atitrushna* (Excessive thirst), *Avila mootrata* (Turbid urine) and *Dourbalya* (Weakness). There was significant improvement in all the laboratory parameters in patients of *Bimbi* (*Coccinia indica*) treated group. The outcome showed that mean reduction in fasting blood sugar level was 19.86%, in PP blood sugar level was 24.52% and in HbA1c level was 8.4%.These outcomes suggest that the results of trial drug i.e., *Coccinia indica* (*Bimbi*) powder was highly significant at p-value <0.001. The drug *Bimbi* showed effectiveness in reducing FBS, PPBS and HbA1c, as results were highly significant. Barley powder used as placebo didn't showed reduction in FBS, PPBS and HbA1c.

KEYWORDS: Diabetes, *Madhumeha, Bimbi, Coccinia indica.*

INTRODUCTION

The recent reports of International Diabetes Federation (IDF) shows that, all over the world there are 415 million people suffering from diabetes mellitus, between the age of twenty to seventy nine years, with 8.8% of global prevalence, and it is expected that by 2040 it will grow up to 642 million, with a prevalence of 10.4%. Environmental conditions also play significant role, most of the sufferer live in the urban area, and very less come from the rural area.[1]

Many drugs are available in the market to control diabetes. In most instances these are expensive and may also have adverse effects like hypoglycemia and obesity. Ayurveda has mentioned many plants useful for pre-diabetes and diabetes condition like *Berberis aristata, Pterocarpus marsupium*, *Tinospora cordifolia, Azadirachta indica, Trichosanthes dioica* and *Trigonellafoenum graecum.*

Bimbi is botanically identified as *Coccinia indica*, belongs to *Cucurbitaceae* family.[2] *Bimbi* is mentioned in various *Samhitas* and *Nighantus* and has been used for treating various disease conditions. As per *Ayurvedic* pharmacopoeia of India[3] *Bimbi* is having *Tikta, Madhura-Rasa, Guru, Ruksa-Guna, Sita-Virya,* & *Katu-Vipaka*. In reference of diabetes, it was first mentioned by Acharya Bhavaprakash[4] as *Mutra-sangrahaniya* and described beneficial in *Madhumeha*. Acharya Priyavrata Sharma[5] in *Dravyaguna vigyan* mentioned its effect on *Mutravaha-sansthana*, especially beneficial in *Madhumeha*, *Ojomeha* & *Puyameha.*

Aim & Objective

To evaluate therapeutic efficacy of *Coccinia indica (Bimbi)* in *Madhumeha* (type 2 diabetes mellitus).

Material and methods

Study was approved by the research development committee (RDC) of Uttrakhand Ayurved University, Harrawala, Dehradun and clinical study also approved by Institional Ethical

Committee (IEC), Uttaranchal Ayurvedic Collage on 11 May 2019.

The clinical trial was also registered in CTRI, Govt. of India on 17 July 2019 with reference no. REF/2019/07/026977 and trial registration number CTRI/2019/07/020228. The study was commenced thereafter.

Source of the drug: The plant material was purchased from Rudrapur, Uttrakhand and authenticated (with ref.no.–NISCAIR/RHMD/ consult/ 2018/3219-20) by Dr. Sunita Garg (Emeritus Scientist, CSIR-NISCAIR, New Delhi). The authenticated sample i.e., *Coccinia indica, Bimbi* leaves were powdered and passed through the sieve no.14 and stored in an air tight container for further studies.

Preparation of the drug for clinical trial: *Bimbi* powder and Barley powder was made under hygenic condition.

Dosage: 6 gm of *Bimbi* powder twice daily to be taken with water, 30 minutes before food, by the patients of group-A. 6 gm of Barley powder twice daily to be taken with water, 30 minutes before food, by the patients of group-B i.e. placebo group.

Source of the patients: A free medical camp was organised in the premises of Uttaranchal Ayurvedic hospital, Rajpur road, Dehradun, dated on November 2, 2019 and again rescheduled on November 12, 2019. During this period, many patients were enrolled while more patients enrolled themselves from November 2019 to January 2020. A total of 41 patients were selected randomly for the study irrespective of sex, caste, race and religion. Out of 41 patients, 11 couldn't complete the study.

Study design: 30 selected patients were divided into two groups, 15 patients in each group i.e A & B.

Group A-(Trial group of 15 patients) A pack of 180 gms was given to each patient of trial group A on visit-1 (day-0) and visit-2 (day-15). Further on visit-3 (day-30) two packets each of 180 gms *Bimbi* powder were given (for next 30 days).

Groups B- (Placebo group of 15 patients) A pack of 180 gms of Barley flour was given on visit-1 (day-0) and visit-2 (day-15) to every patient enrolled in this group. On visit-3 (day-30) two packets each of 180 gms were given (for next 30 days intake).

Type of study: Single blind study

Number of patients: Total 30 Patients completed the study.

Duration of treatment: Total duration of treatment was 60 days

Follow up: Patients were advised to visit for follow-up on day 0, 15th, 30th, & 60th for testing of the objective parameters and to ascertain the adverse effects of the treatment if any.

Inclusion criteria

- Patients presenting with or without symptoms like polyuria, excessive thirst, turbid urine and weakness.
- Patients of either sex between the age group of 30 to 60 years.
- Patients of type 2 diabetes mellitus with the FBS ranging between 120 mg per dl to 180 mg per dl and PPBS ranging between 160 mg per dl to 300 mg per dl.
- Established cases of type 2 diabetes mellitus without complications.

Exclusion criteria

- Juvenile diabetes mellitus.
- Patients below the age of 30 years and above the age of 60 years.
- Patients suffering from diabetes mellitus due to secondary causes, pregnancy and other systemic disorders which interferes with course of treatment.

Assessment

Subjective parameters

The subjective parameters include for the assessment criteria are as below-

- Excessive urination (*Prabootha mootrata*)
- Turbid urine (*Avila mootrata*)
- Excessive thirst (*Atitrushna*)
- Weakness (*Dourbalya*)

Scoring has given to all the signs and symptoms from grade 0-3 according to the severity and has documented properly before the treatment, after 15 days, 30 days and 60 days of the treatment.

***Prabootha mootrata* (polyuria or excessive urination): quantity of urine**

1.50 to 2.00 liters/24 hrs.	:	0
>2.00 to 2.50 liters /24 hrs.	:	1
>2.50 to 3.00 liters / 24 hrs.	:	2
>3.00 liters / 24 hrs.	:	3

Frequency of urine

3-5 times per day, no or rarely at night	:	0
6 - 8 times per day, 1-2 times per night	:	1
9-11 times per day, 3-4 times per night	:	2
>11 times per day, > 4 times per night	:	3

***Atitrushna* (polydipsia or excessive thirst)**

Feeling of thirst 7-9 times/24 hr, either/or intake of water 5-7 times/24 hr with quantity	:	0
Feeling of thirst 9 - 11 times/24 hr, either	:	1

/or intake of water 7 - 9 times/24 hr with quantity 2.0 - 2.50 liter/24 hr

| Feeling of thirst 11-13 times/24 hr, either /or intake of water 9-11 times/24 hr with quantity 2.50 -3.00 liter/24 hr | : | 2 |
| Feeling of thirst >13 times/24 hr, either/ or intake of water >11 times/24 hours with quantity >3.00 liter/24 hr | : | 3 |

Avila mootrata (turbid urine)

Crystal clear fluid	:	0
Faintly cloudy or hazy with slight turbidity	:	1
Turbidity clearly present and newsprint easily read through test tube	:	2
Newsprint not easily read through test tube	:	3

Dourbalya (Weakness)

Very active	:	0
Active	:	1
Moderate active	:	2
Dull	:	3

Objective parameters

Investigations of blood

- Fasting blood sugar (FBS)
- Post-prandial blood sugar (PPBS)
- HbA1c.

Urine

- Fasting urine sugar (FUS)
- Post prandial urine sugar (PPUS)

Statistical design

Statistical analysis was done by paired student "t" test. The evaluation was done on the statistical analysis of the results obtained (as per American Diabetes Association) and it was compared before and after treatment.

Observations

The findings of data obtained at the start of study have been organized as mentioned below:

Age wise distribution

Table 1: Distribution of patients according to age

Age in year	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
20-30	-	1	1	3.4
31-40	2	4	6	20.0
41-50	7	9	16	53.3
51-60	6	1	7	23.3
Total	15	15	30	100

Sex wise distribution

Table 2: Distribution of patients according to sex

Sex	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Male	5	9	14	46.7
Female	10	6	16	53.3
Total	15	15	30	100

Marital status wise distribution

Table 3: Distribution of patients according to Marital status

Marital status	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Married	15	15	30	100
Un-married	-	-	0	0
Total	15	15	30	100

Habitat wise distribution

Table 4: Distribution of patients according to Habitat status

Habitat status	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Rural	4	5	9	30
Urban	11	10	21	70
Total	15	15	30	100

Family history wise distribution

Table 5: Distribution of patients according to Family history

Family History	Group-A (*Bimbi*)	Group-B (Barley)	No. of Patients	Percentage (%)
Positive	8	5	13	43.3
Negative	7	10	17	56.7
Total	15	15	30	30

Weight wise distribution

Table 6: Distribution of patients according to Weight in Kg

Weight in kgs	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
50-60	2	2	4	13.3
61-70	5	4	9	30.0
71-80	5	6	11	36.7
81-90	3	2	5	16.7
91-100	-	1	1	3.3
Total	15	15	30	100

Educational Status wise distribution

Table 7: Distribution of patients according to Educational status

Education	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Graduates	4	7	11	36.7
Intermediate	7	7	14	46.6
Uneducated	4	1	5	16.7
Total	15	15	30	100

Occupation wise distribution

Table 8: Distribution of patients according to Occupational status

Occupation	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Service	4	6	10	33.3
Businessman	2	3	5	16.7
Housewife	7	6	13	43.3
Retired	2	0	2	6.7
Total	15	15	30	100

Socio-economical status wise distribution

Table 9: Distribution of patients according to Socio-economical status

Socio-economical Status	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Poor	4	5	9	30.0
Lower Middle Class	5	3	8	26.7
Upper Middle Class	6	7	13	43.3
Total	15	15	30	100

Addiction wise distribution

Table 10: Distribution of patients according to Addiction

Addiction	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Alcoholics	-	2	2	6.7
Smoking	2	3	5	16.7
Alcohol+Smoking	1	3	4	13.3
Alcohol+Smoking &Tobacco	2	2	4	13.3
No Addiction	10	5	15	50
Total	15	15	30	100

Duration of illness wise distribution

Table 11: Distribution of patients according to Duration of illness

Duration of Illness	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
0-5 Years	4	3	7	23.4
5-10 Years	4	6	10	33.3
>10 Years	7	6	13	43.3
Total	15	15	30	100

Dietary habits (*Ahara*) wise distribution

Table 12: Distribution of patients according to *Ahara*

Diet	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Veg.	9	5	14	46.7
Mixed	6	10	16	53.3
Total	15	15	30	100

Sleep pattern (Nidra) wise distribution

Table 13: Distribution of patients based on Nidra

Nidra	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Sound	2	2	4	13.3
Moderate	9	6	15	50.0
Disturbed	4	7	11	36.6
Total	15	15	30	100

Symptoms wise distribution

Table 14: Distribution of patients based on Symptoms

Symptoms	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
Excessive urination (*Prabootha ootrata*)	15	15	30	100
Excessive thirst (*Atitrushna*)	15	15	30	100
Turbid urine (*Avila mootrata*)	14	15	29	96.6
Weakness (*Dourbalya*)	12	9	21	70.0

Fasting Blood Sugar (Day-0) wise distribution

Table 15: Distribution of patients according to fasting blood sugar (Day-0)

FBS (mg%)	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
<200	8	7	15	50.0
200-250	3	3	6	20.0
250-300	3	1	4	13.3
>300	1	4	5	16.7
Total	15	15	30	100

Post-Prandial blood Sugar (Day-0) wise distribution:

Table 16: Distribution of patients according to Post-prandial blood sugar (Day-0)

PPBS (mg%)	Group-A (*Bimbi*)	Group-B (Barley)	No. of Patients	Percentage (%)
<200	5	3	8	26.6
200-250	3	3	6	20.0
250-300	4	3	7	23.3
>300	3	6	9	30.0
Total	15	15	30	100

Glycosylated haemoglobin (Day-0) wise distribution

Table 17: Distribution of patients according to HbA1c (Day-0)

HbA1c	Group-A (*Bimbi*)	Group-B (Barley)	No. of patients	Percentage (%)
<7	2	2	4	13.3
7-8	3	5	8	26.7
8-9	4	3	7	23.3
>9	6	5	11	36.7
Total	15	15	30	100

Results of Clinical Study

The patients were analyzed statistically and results obtained were mentioned below:

Table 18: Results of laboratory parameters in group-A (Trial group)

Lab Tests	Mean B.T	Mean A.T	Mean Dif.	% Mean Reduction	±S.D	±S.E	T value	P Value	Result	P value Summary
FBS	186.3	149.3	37	19.86	8.23	2.12	6.58	<0.001	H.S.	×××
PPBS	249.9	188.6	61.3	24.52	10.31	2.66	5.90	<0.001	H.S.	×××
HbA1c	8.64	7.91	0.73	8.44	2.84	0.73	8.46	<0.001	H.S.	×××
FUS	0.28	0.17	0.11	39.28	27.35	7.06	3.23	<0.01	S	××
PPUS	0.36	0.20	0.16	44.44	38.56	9.95	5.53	<0.001	H.S	×××

Table 19: Results of laboratory parameters in group-B (Placebo group)

Symptoms	Mean B.T	Mean A.T	Mean Dif.	% Mean Reduction	±S.D	±S.E	T value	P value	Result	P value Summary
FBS	229.4	226.9	2.5	1.09	5.66	1.46	0.87	>0.05	N.S.	-
PPBS	269.9	263.2	6.67	2.48	23.02	5.94	0.96	>0.05	N.S.	-
HbA1c	8.49	8.45	0.04	0.47	1.38	0.35	1.24	>0.05	N.S.	-
FUS	0.36	0.33	0.027	7.5	35.19	9.08	1.46	>0.05	N.S.	-
PPUS	0.38	0.36	0.02	5.26	12.10	3.23	1.46	>0.05	N.S.	-

Table 20: Results of symptomatic parameters in group-A (*Bimbi*)

Symptoms	Mean B.T	Mean A.T	Mean Dif.	% Mean Reduction	±S.D	±S.E	T value	P Value	Result	P value Summary
Excessive urination (*Prabootha Mootrata*)	2.20	1.00	1.20	54.54	26.33	6.79	11.22	<0.001	H.S.	×××
Excessive thirst (*Atitrushna*)	2.20	1.07	1.13	51.36	26.33	6.79	12.47	<0.001	H.S.	×××
Turbid urine (*Avila Mootrata*)	1.87	0.87	1.00	53.47	32.65	8.431	10.25	<0.001	H.S.	×××
Weakness (*Dourbalya*)	1.20	0.33	0.87	72.5	39.94	10.31	6.50	<0.001	H.S.	×××

Table 21: Results of symptomatic parameters in group-B (Barley)

Symptoms	Mean B.T	Mean A.T	Mean Dif.	% Mean reduction	±S.D	±S.E	T value	P value	Result	P value Summary
Excessive urination (*Prabootha Mootrata*)	2.00	1.86	0.14	7.00	15.00	3.87	1.46	>0.05	N.S.	-
Excessive thirst (*Atitrushna*)	1.93	1.86	0.07	3.62	8.60	2.22	1.00	>0.05	N.S.	-
Turbid urine (*Avila Mootrata*)	1.66	1.60	0.06	3.61	12.91	3.33	1.00	>0.05	N.S.	-
Weakness (*Dourbalya*)	0.73	0.66	0.07	9.58	25.82	6.66	1.00	>0.05	N.S.	-

DISCUSSION

In group-A (*Bimbi*) after the treatment of 60 days, there was significant improvement in all the laboratory parameters in patients of this group. The outcome showed that mean reduction in fasting blood sugar level was 19.86%, in PP blood sugar level was 24.52% and in HbA1c level was 8.4%. These outcomes suggest that the results of trial drug i.e. *Coccinia indica* (*Bimbi*) powder was highly significant at p-value <0.001.

Along with the blood parameters, fasting urine sugar level also showed significant mean

reduction by 39.28% at P-value <0.01 and PP urine sugar level showed highly significant mean reduction by 44.44% at P-value <0.001.

There was also a significant improvement in all the symptomatic parameters. The mean reduction in *Prabootha mootrata* (Excessive urination) was 54.54%, in *Atitrushna* (Excessive thirst) was 51.36%, in *Avila Mootrata* (Turbid urine) % was 53.47% and in *Dourbalya* (Weakness) 72.5%. Thus the improvement observed in all symptomatic parameters in treated group-A (*Bimbi*) was highly significant statistically at P-value <0.001.

In group-B after the treatment of 60 days, there was no significant improvement in all the laboratory parameters and all symptomatic parameters were non-significant statistically at P-value >0.05.

The overall outcome of the study suggests that the *Coccinia indica* (*Bimbi*) powder showed encouraging results on the patients of Diabetes mellitus Type-2. The present study supports to the use of *Coccinia indica* (*Bimbi*) as anti-diabetic medicine, as mentioned in Ayurvedic texts.[6,7]

The present study showed that there was no adverse or undesirable side effect noted in terms of clinical prevention or lab investigation post studies. It is important to note that *Pathya-apathya* (Dietary advices) plays an important role in the management of diabetes mellitus type-2, the patients who followed the prescribed diet & lifestyle guidelines diligently responded well & took less time to recover.

The present study illustrates that the overall effect of *Coccinia indica* (*Bimbi*), with its *Rasa, Guna, Veerya, Vipaka* & *Karma*, corrected the metabolism of blood sugar, eventually helps reduce the level of fasting blood sugar, PP blood sugar, HbA1c level, reduces the fasting urine sugar level, & PP urine sugar level & also shows significant improvement in symptomatic parameters of the diabetic patients.

CONCLUSION

The study confirmed that *Bimbi* was effective in treatment of *Madhumeha* and reduced majority of the symptoms of illness that including *Prabootha mootrata* (Excessive urination), *Atitrushna* (Excessive thirst), *Avila mootrata* (Turbid urine) and *Dourbalya* (Weakness).

All the patients tolerated medicines very well and no side effects were reported by any of the patients, suggesting there by that the drugs selected for current clinical trial was absolutely safe for internal usage along with controlling the levels of blood and urine sugar effectively.

It can be concluded that *Bimbi* was effective in relieving symptoms of diabetes and normalizing FBS, PPBS, HbA1c and urine sugar level.

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