

## Effect of Cinnamon (*Cinnamomum Cassia*) intervention on Blood Glucose of Middle Aged Adult Male with Non Insulin Dependent Diabetes Mellitus (NIDDM)

Richa Soni and Vibha Bhatnagar

*Department of Foods and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, Udaipur 313 001, Rajasthan, India*

**KEYWORDS** Fasting Blood Glucose. Post Prandial Blood Glucose. Lipid Profile

**ABSTRACT** The present study was conducted to find out the effect of oral administration of cinnamon (*Cinnamomum cassia*) on non insulin dependent diabetes mellitus (NIDDM) patients of Udaipur city (Rajasthan). Thirty type 2 diabetics were divided into two groups (15 in each) experimental and control group. Experimental group was supplemented with 2g cinnamon powder filled in capsules (4capsules/day/person) for 40 days. Another group of 15 subjects served as control. Fasting and post prandial blood sugar were estimated at initial level (0 day), after 20 days and finally after 40 days. Diet of diabetics when compared with dietary modifications was found to be high in fat (131%), calcium (190.37%), thiamine (180.58%), vitamin C (117.40%) and niacin (110%) adequate in energy (103.82%), carbohydrates (80.35%),  $\beta$  carotene (96.14%) and riboflavin (90.86%). In addition diet was moderately low in protein (72.67%) and iron (54.73%) where as extremely low in fibre (15.94%). Data regarding blood glucose level showed that at initial level fasting blood glucose of experimental group was  $148.73 \pm 3.69$  mg/dl which reduced to  $134.0 \pm 3.12$  mg/dl after 20<sup>th</sup> day and further reduced to  $120.66 \pm 4.70$  mg/dl at the completion of the study and was statistically significant ( $p > 0.05, p > 0.01$ ). Post prandial blood sugar also reduced significantly ( $p > 0.05, p > 0.01$ ) from  $187.66 \pm 3.29$  mg/dl (0 day) to  $172.93 \pm 3.51$  mg/dl (20<sup>th</sup> day) and again reduced to  $163.6 \pm 5.09$  mg/dl after 40 days of intervention in the experimental group. This was also statistically significant at both 5 percent and 1 percent level of significance. No significant reduction was observed in both fasting and post prandial blood sugar in control group. The study reveals that cinnamon is effective in controlling blood sugar of people with type 2 diabetes.

### INTRODUCTION

Non insulin dependent diabetes mellitus (NIDDM) is the commonest form of diabetes mellitus globally as well as in India. The prevalence of diabetes for all age group world wide was 2.8 percent in 2000 and estimated to be 4.4 percent in 2030. The number of people with diabetes projected to rise from 171 million in 2006 to 366 million in 2030 (Roglic et al. 2004) The prevalence rate of diabetes in India has increased from 0.5 percent to 15.2 percent in 1978 to 2001 (Gupta and Pathak 2003). Hereditary factor, obesity, sedentary life style and aging have been shown to increase the risk for diabetes.

Proper medical care and regular monitoring of diabetes is essential not only to keep the disease under control but also to prevent an assort-

ment of other diabetes related problems. Because no cure has been identified, hence management of diabetes with diet, exercise and drugs has been emphasized.

It has been reported that cinnamon (*Cinnamomum cassia*) has insulin like activity and it contains an active ingredient water soluble polyphenol compound MHCP (methyl hydroxy chalcon polymer). It initiate insulin, triggers its receptors and work synergistically with insulin cells. Cinnamon also reduced cholesterol level and improves lipid metabolism (Jarvill and Karjee 2003)

Diabetes constitutes more than 15 percent people of our country and modern allopathic system of medicine has not been able to reach the remote rural areas for various reasons. A large of people can not afford the expenses of elaborate methods of treatment and in recent years there is more inclination towards alternative therapies of treatment. In India production and consumption of cinnamon is good and being used in various traditional recipes. Therefore it was considered worthwhile to probe into the possibilities of treatment of diabetic patients using

---

*Address for correspondence:*

Miss Richa Soni, D/o Mr. Brij lal Soni  
7, Dalalon ki pol, Ganesh Ghati, Udaipur 313001,  
Rajasthan, India

*Telephone:* 0294-2529589

*E-mail:* soni\_richa22@rediffmail.com

cinnamon by conducting scientific research to find out the effect of cinnamon supplementation on blood glucose of middle aged adult male with non insulin dependent diabetes mellitus (NID-DM).

### METHODS AND MATERIALS

Thirty males having type 2 diabetes since last 3-4 years and not on insulin therapy, in the age group of 40 to 60 years were selected from M.B. hospital Udaipur (Raj). The selected subjects were divided into two groups experimental and control group (15 in each). Patients in the experimental group were provided 2 g of cinnamon in the powdered form filled in empty gelatin capsules (4 capsules/day/person) for a period of 40 days. Subjects were asked to take one capsule after each of the four meals i.e. breakfast, lunch, evening tea and dinner for 40 days. The subjects were advised to take the capsules immediately after meals. Group II were served as control group receiving no supplementation. All the subjects were asked to follow their normal routine and take their normal diet and usual diabetic medicine. A structured interview schedule was developed to collect information regarding background profile, socio economic status and information about disease and their personal habits of the subjects.

Dietary survey was conducted at the embryonic stage of intervention by "24 hours recall method" for three consecutive days. The different items of foods cooked and consumed were asked and then converted in terms of raw ingredients. Average nutrient composition of the diet consumed by the subjects was calculated by using food composition tables (Gopalan et al. 1989) and results were compared with the dietary recommendations for diabetes suggested by Raghuram et al. (2000).

The impact of cinnamon intervention on fasting and post prandial blood glucose was estimated three times at initial (0 day), after 20 days and finally after 40 days. For fasting blood glucose venous blood samples were taken after an overnight fasting and for post prandial blood glucose blood samples were taken two hours after ingestion of food. The blood glucose was estimated with ERBA glucose estimation kit by GOD-POD end point method. The data gathered were statistically analyzed as per the objectives of the study.

### RESULTS AND DISCUSSION

The information regarding family background, socio economic status, life style and information about disease and personal habits were collected through an interview schedule.

**Background Information:** Out of 30 subjects 96.6 percent were Hindu and only one person belonged to Sikh community. 79.9 percent were literate. 50 percent were government servants, 20 percent were engaged in private jobs and 30 percent were having their own business.

**Information about the Disease:** Most (53.3%) of the subjects were found to be suffering from diabetes since last 4-8 years, 23.3 percent each were affected since 8-12 years and <4 years. Out of 30 subjects 12 had positive family history of diabetes. Forty percent subjects were suffering from hypertension, 13.3 percent were suffering from CVD and 20 percent had pain in joints.

**Life Style Pattern:** Data revealed that 13.2 percent subjects were consuming alcohol and 13.3 percent were in the habit of smoking. 63.3 percent were doing exercise and the duration was only 30 minutes.

**Dietary Pattern:** Perusal of Table 1 indicates that out of 30 subjects 73.3 percent were vegetarian and consuming three meals per day. Diet of diabetics was compared with the intake suggested by Raghuram et al. (2000) revealed that the consumption of cereals (98.68%) and milk and milk products (95.06%) was adequate, where as consumption of pulses (65.73%), green leafy vegetables (20%), other vegetables (25%) and fruits (20%) was inadequate. The diet of diabetics was high in fat (183.33%) as compared to balanced diet suggested by Raghuram et al. (2000).

**Table 1: Mean Daily Intake of food by the subjects (n = 30)**

| S. No. | Foods groups(g)  | *Balanced diet | Mean $\pm$ SE      | Percent to balanced |
|--------|------------------|----------------|--------------------|---------------------|
| 1.     | Cereal           | 225            | 217.62 $\pm$ 7.71  | 98.68               |
| 2.     | Pulses           | 60             | 39.44 $\pm$ 3.84   | 65.73               |
| 3.     | GLV'S            | 200            | 40.74 $\pm$ 9.69   | 20                  |
| 4.     | Roots and tubers | 100**          | 20.0 $\pm$ 9.12    | 20                  |
| 5.     | Other vegetables | 200            | 51.11 $\pm$ 9.71   | 25                  |
| 6.     | Fruits           | 100            | 20.92 $\pm$ 5.37   | 20                  |
| 7.     | Milk             | 300            | 285.18 $\pm$ 34.36 | 95.06               |
| 8.     | Fat and oils     | 15             | 28.25 $\pm$ 1.38   | 188.33              |

\*Balanced diet for diabetics suggested by Raghuram et al. (2000).

\*\* ICMR (1998)

GLV's -Green leafy vegetables

When this record of food consumption by the subjects converted in terms of nutrients intake (Table 2) it was revealed that the diet of diabetics was high in fat (131%), adequate in energy (103.82%), B complex vitamins and vitamin C (117.4%) as compared to recommended value. In addition their diet was slightly inadequate in and carbohydrates (80.35%), moderately low in protein (72.67%) and iron (54.75%) where as extremely low in fibre (15.94%).

**Table 2: Mean daily intake of nutrients by the subjects (n = 30)**

| Nutrients                   | RDA*       | Mean $\pm$ SE        | Percent of RDA |
|-----------------------------|------------|----------------------|----------------|
| Energy (Kcal)               | 1500       | 1557.40 $\pm$ 60.14  | 103.82         |
| Protein (g)                 | 70         | 50.87 $\pm$ 2.04     | 72.67          |
| Total Fat (g)               | 41         | 53.71 $\pm$ 3.87     | 131            |
| Carbohydrate (g)            | 244        | 196.07 $\pm$ 7.70    | 80.35          |
| Dietary Fibre (g)           | 37         | 5.90 $\pm$ 0.41      | 15.94          |
| Calcium (mg)                | 400**      | 761.5 $\pm$ 71.2     | 190.37         |
| Iron (mg)                   | 28**       | 15.33 $\pm$ 0.98     | 54.75          |
| $\beta$ carotene ( $\mu$ g) | 2400**     | 2307.44 $\pm$ 438.43 | 96.14          |
| Thiamin (mg/kcal)           | 0.5/1000** | 1.39 $\pm$ 0.05      | 180.51         |
| Riboflavin (mg/kcal)        | 0.6/1000** | 0.84 $\pm$ 0.05      | 90.86          |
| Niacin (mg/kcal)            | 6.6/1000** | 11.38 $\pm$ 0.53     | 110            |
| Vitamin C (mg)              | 40**       | 46.96 $\pm$ 5.03     | 117.4          |

\*Raghuram et al (2000)

\*\*ICMR(1989)

These findings are in close conformity with the results of the study conducted by Sharma and Chaudhary (2005) they observed higher intake of fat, B complex vitamins, vitamin C and calcium and lower intake of protein, iron and very low intake of fibre among diabetic subjects.

### Effect of Cinnamon Intervention on Blood Glucose

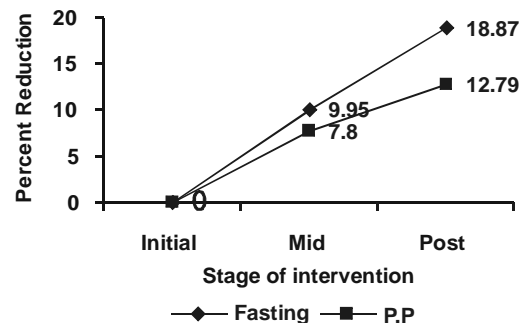
**Fasting Blood Glucose:** The magnitude of the effect of cinnamon intervention on fasting and post prandial blood sugar is presented in table 3. The fasting blood sugar reduced from 148.73 $\pm$ 3.69 mg/dl (initial value) to 134.0 $\pm$  3.12 mg/dl at 20 days after intervention and continued to reduce to 120.66 $\pm$ 4.70 mg/dl at the completion of the study in experimental group. This reduction was statistically significant at both 5 percent and 1 percent level of significance. No significant reduction was observed in control group. The reduction in the fasting blood glucose was 18.87 percent in experimental group.

This indicates that cinnamon intervention had definite positive effect on fasting blood sugar levels of the subjects.

**Post Prandial Blood Glucose:** Two hours after food ingestion, post prandial blood glucose levels were recorded. The initial (0 day) mean post prandial blood glucose value was 187.6 $\pm$ 3.29 mg/dl for experimental group which reduced to 172.93 $\pm$ 3.51 mg/dl at the mid (20<sup>th</sup> day) of the intervention and further reduced to 163.6 $\pm$ 5.09mg/dl at the end of the intervention (40<sup>th</sup> day). There was 12.79 percent reduction in post prandial blood glucose which was statistically significant at both 5 percent and 1 percent level of significance (Fig. 1). (P>0.05 and P>0.01). There was no indication of reduction of post prandial blood glucose in the control group.

The finding of the present investigation confirms that cinnamon is beneficial in reducing glycaemic load and improves the blood sugar response both (fasting and post prandial) in diabetics.

Similar findings were observed by Khan et al. (2003) on 60 type 2 diabetics randomly assigned to three groups receiving 1,3,6 g of cinnamon/ day for 40 days. Cinnamon supplementation significantly reduced the fasting and post prandial blood glucose. Anuradha and Devi (2004) also reported significant reduction in both fasting and post prandial blood glucose after 4 g cinnamon supplementation for 90 days.



**Fig. 1.** Percent reduction in blood sugar level of Experimental group

### CONCLUSION

The results of the present study demonstrated that intake of 2 g. of cinnamon/day significantly reduce fasting and post prandial blood glucose in people with type 2 diabetes. No ad-

**Table 3: Effect of cinnamon intervention on mean blood glucose levels (mg/dl) of the subjects**

| S. No. | Parameters                | Initial(a)  | After 20days(b) | After 40days(c) | 't' value a v/s b | 't' value a v/s c |
|--------|---------------------------|-------------|-----------------|-----------------|-------------------|-------------------|
| 1.     | <i>Experimental Group</i> |             |                 |                 |                   |                   |
|        | Blood Sugar (F)           | 148.73±3.69 | 134.00±3.12     | 120.66±4.70     | *11.41            | *5.68             |
|        | Blood Sugar (P.P.)        | 187.66±3.29 | 172.93±3.51     | 163.60±5.09     | *8.93             | *5.29             |
| 2.     | <i>Control Group</i>      |             |                 |                 |                   |                   |
|        | Blood Sugar (F)           | 152.93±5.77 | 155.46±4.82     | 152.93±5.37     | 0.30 NS           | 0.17 NS           |
|        | Blood Sugar (P.P.)        | 196.44±5.18 | 193.22±3.47     | 195.86±4.30     | 0.97 NS           | 0.12 NS           |

\* Significant at both (P<.01) and (P <.05) level. NS-Non Significant

verse effect of cinnamon was observed on the health status of subjects and it can be concluded that cinnamon intervention is effective in lowering fasting and post prandial blood glucose. The study strongly recommends the use of cinnamon enriched products in type 2 diabetes mellitus.

### REFERENCES

- Anuradha V, Devi A 2004. Hypoglycemic effect of Cinnamon and Cumin seed powder on type 2 Diabetes. *The Indian Journal of Nutrition and Dietetics*, 49(9): 370-374.
- Gopalan C, Ramaasastri BV, Balsubramaman SC 1989. *Nutritive Value of Indian Foods*. Hyderabad: NIN (ICMR).
- Gupta OP, Pathak S 2003. Pandemic trends in prevalence of diabetes mellitus and associated coronary heart diseases in India- their causes and prevention. *International Journal of Developing Countries*, 23: 37-41.
- ICMR 1989. *Nutrient Requirement and Recommended Dietary Allowances for Indians*. A Expert Group of ICMR,. Hyderabad: NIN (ICMR)
- ICMR 1998. *Dietary Guidelines for Indians*. Hyderabad: NIN (ICMR)
- Jarvill J, Karjee, T 2003. A hydroxy chalcone derived from cinnamon, function as mimetic to insulin in 3T3 XT adipocytes. (2003) From< <http://diabetesjournal.org/google> search.
- Khan A, Safdar M, Khan HMA, Khallak KN, Richard A 2003. Cinnamon improves glucose and lipid of people with type 2 diabetes. *Pakistan Journal of Nutrition*. 2(5): 312-319.
- Raghuram TC, Pasricha S, Sharma RD 2000. *Diet and Diabetes*. Hyderabad: National Institute of Nutrition (ICMR)
- Roglic F, Guean A, Sicree K 2004. Prevalence of Diabetes by country. *Diabetes Care*, 27(10): 2568-2569.
- Sharma S, Chaudhary M 2005. *Glycemic Response to Selected Pulse Based Products*. Ph. D. Thesis (unpublished), Udaipur: Maharana Pratap University of Agriculture and Technology.