

IMPROVEMENT IN BLOOD GLUCOSE PROFILE AFTER SUPPLEMENTATION WITH CINNAMON POWDER IN MEN WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

India, with 33 million diabetic individuals, leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the “diabetes capital of the world”. Diabetes mellitus is characterized by Chronic Hyperglycemia with disturbances of Carbohydrate, Fat & Protein Metabolism resulting from defects in insulin secretion, Insulin action or both. Of primary interest for Diabetics, are nutraceuticals, which are natural products found in plants and are being explored for their therapeutic value. Cinnamon has insulin mimetic property and thus helps in controlling the blood glucose levels in men with diabetes mellitus. Therefore, the present study was designed to assess the effects of cinnamon powder supplementation on blood glucose profile in men with type 2 diabetes mellitus. Sixty adult men suffering from Type 2 diabetes mellitus were selected purposively for the study, out of which 20 comprised the control group & 40 comprised the experimental group. The intervention comprised of supplementation with 2 grams of cinnamon powder/ day for a period of two months. Fasting blood glucose levels, post prandial blood glucose levels and glycated haemoglobin were estimated before and after intervention. The results of the study indicate a significant reduction ($p > 0.001$) in the mean fasting blood glucose levels, postprandial blood glucose levels and HbA1C levels after intervention, thus indicating that supplementing the diet with 2 grams of cinnamon powder /day for a period of 2 months brings about an improvement in the blood glucose profile of men with type 2 diabetes mellitus. The study concluded that Cinnamon powder supplementation is effective in reducing the blood sugar levels of men with type 2 diabetes mellitus.

INTRODUCTION

Diabetes mellitus describes a Metabolic Disorder of Multiple Etiology Characterized by Chronic Hyperglycemia with disturbances of Carbohydrate, Fat & Protein Metabolism resulting from defects in insulin secretion, Insulin action or both (WHO, 2006).

It is one of the most common chronic disease in nearly all countries, and continues to increase in number and significance, as changing lifestyles lead to reduced physical activity and increased obesity.

Type 2 diabetes is the commonest form of diabetes constituting 90 percent of the diabetic population. The global prevalence of diabetes is estimated to increase, from 4 percent in 1995 to 5.4 percent by the year 2025 (King *et al.*, 1998).

India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the “diabetes capital of the world”. India, with 33 million diabetic individuals, currently has the highest incidence of diabetes worldwide; these numbers are predicted to increase to 80 million by the year 2030 (Wild *et al.*, 2004).

Modern allopathic system and medicine has not been able to reach the remote rural areas for various reasons.

Insufficiency of current therapies for the treatment of the diabetes combined with both a lack of trust in conventional medical treatment and an inability of the economy to absorb the cost of pharmaceuticals, have created a growing public interest in dietary supplements and botanicals.

The use of herbs has more than tripled over the last 10 years and a whole new industry referred to as nutraceuticals has evolved.

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A number of spices and herbs have a long history of traditional use in treating elevated blood sugar levels. Cinnamon, granted GRAS (Generally Recognized as Safe) status by the USFDA is generally safe when ingested and has antioxidant and antibacterial effects (Lopez *et al.*, 2005). Cinnamon has a regulatory role in blood glucose levels as it contains a water soluble polyphenol, Methyl Hydroxyl Chalcone Polymer (MHCP) which has an insulin mimetic effect (Jarvil and Taylor, 2001).

Objective

The present study was undertaken in order to assess the effect of cinnamon supplementation on the blood glucose profile of the adult men suffering from type 2 Diabetes mellitus.

MATERIALS AND METHODS

The study was conducted at Solanki Hospital, Alwar, Rajasthan. For the present study, a total of 60 adult men were selected using the purposive sampling technique out of which 20 men comprised the Control group whereas 40 men comprised the Experimental group. All the subjects fulfilled the inclusion criteria which were as follows:

Inclusion Criteria

- Subjects with Type 2 diabetes mellitus
- Fasting Blood sugar levels between 140-400 mg/day
- Age 40 to 55 years
- Not on insulin therapy.
- All subjects taking Sulfonylurea and Biguanides during the course of the study.
- Subjects willing to participate in the study.
- Residents of Alwar city only.

The Intervention comprised of giving cinnamon supplementation (2 gm powder/ day) for a period of two months to the subjects belonging to the experimental group. The Cinnamon bark was sorted for adulteration, ground to fine powder, weighed and packed in Ziplock pouches. Compliance was monitored by contact with the subjects.

Bio Chemical Analysis

Bio chemical analysis done by collection of fasting bloods samples for measurements of fasting blood glucose (FBG) levels, post prandial blood glucose (PPBG) levels and Glycated haemoglobin (HbA1C). All biochemical measurements were carried out by the same team of laboratory technicians using an auto analyzer.

The FBG, PPBG and HbA1C levels were measured at base line and after two months of study. The WHO, 2006 reference values for Fasting & post prandial blood glucose levels and HbA1C levels were used as cut offs.

An interview schedule was prepared for obtaining the information regarding background information of patients such as age, occupation, type of family, monthly income, duration and family history of diabetes. The research did not suggest any alterations in other aspects like medical care, diet or exercise.

RESULTS AND DISCUSSION

Results

The demographic profile of the subjects revealed that the mean age of the subjects was 49 years. A majority of subjects (72.5%) had a monthly income between Rs. 15000/- to 30000/- per month and had a nuclear family.

A highly significant ($p < 0.001$) reduction was observed after intervention in the mean FBG & PPBG levels as well as HbA1C levels of the subjects belonging to the experimental group, whereas in the control group, a significant increase in the mean FBG levels, PP blood glucose levels and HbA1C levels was observed after intervention (Table 1).

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Table 1: Within Group & Between Group Comparison of Blood Glucose parameters of subjects before and after intervention

Blood Glucose Parameters			Pre Intervention (Mean ± S.D.)	Post Intervention	't' value
Fasting Blood Glucose (mg/dl)	Experimental		176.19 ± 34.19	154.17 ± 26.56	8.455**
	Control		169.38 ± 19.90	173.96 ± 20.66	4.386**
t-value			0.822 (ns)	-2.918*	
Past Prandial Blood Glucose (mg/dl)	Experimental		259.20 ± 42.88	225.34 ± 39.16	11.773**
	Control		240.21 ± 42.23	246.09 ± 39.90	4.393**
t-value			1.625 (ns)	-1.922 (ns)	
Hb A/C	Experimental		8.73 ± 0.99	7.61 ± 0.72	11.054**
	Control		8.37 ± 0.66	8.50 ± 0.64	4.761**
t-value			1.485 (ns)	-4.660**	

Note:

ns = non significant

* = $P < 0.05$

** = $p < 0.01$

*** = $P < 0.001$

The mean blood glucose profile of subjects belonging to both the control and experimental groups was compared at pre and post intervention. The results revealed that at pre intervention, the difference in terms of blood glucose profile between both the groups was not significant. However, at post intervention, a statistically significant difference was observed between groups for mean FBG levels ($p < 0.01$) and HbA1C ($p < 0.001$) levels, whereas a non significant difference was observed for PPBG levels. The findings suggest that intervention with cinnamon powder supplementation could lead to an improvement in the blood glucose profile of adult men suffering from Type 2 Diabetes mellitus.

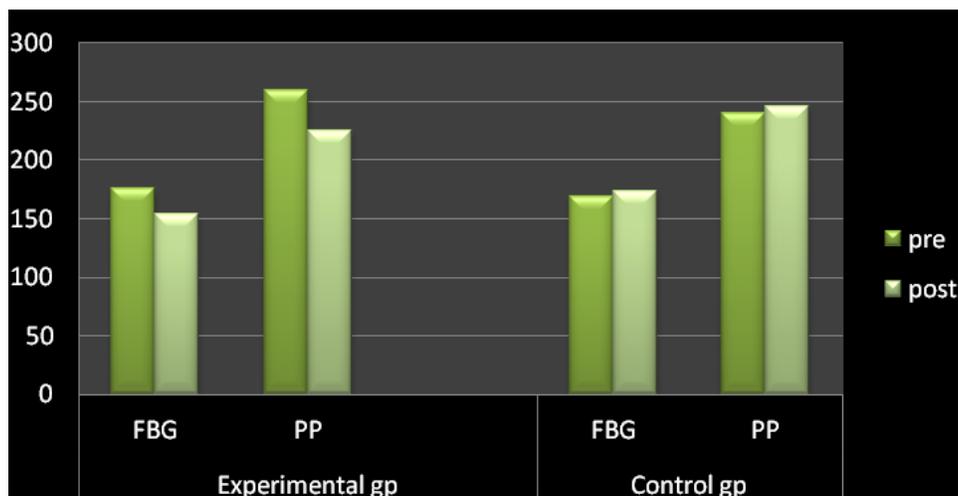


Figure 1: Fasting and postprandial Blood Glucose levels of subjects at pre and post intervention

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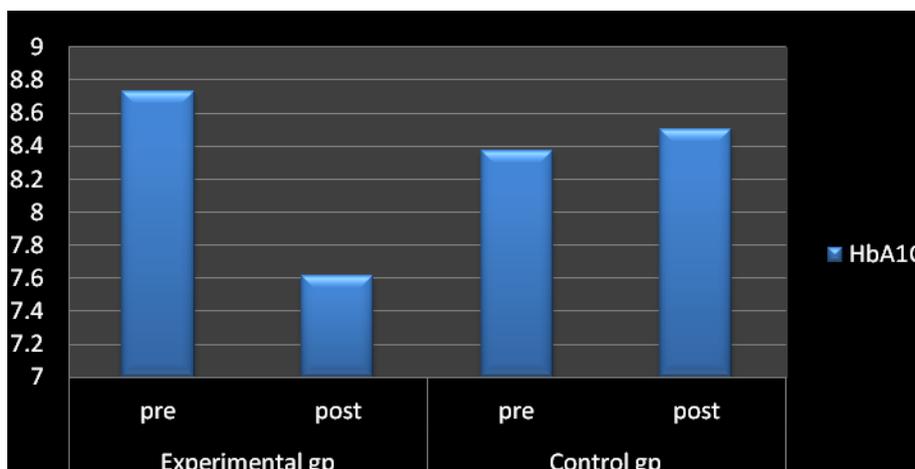


Figure 2: Glycated haemoglobin levels of subjects at pre and post intervention

Discussion

In the present study, we investigated the effects of cinnamon on blood glucose profile of adult men with type 2 diabetes mellitus. Two grams per day of cinnamon powder was given to the selected subjects for a period of 2 months. The results of the present study revealed a significantly lower fasting and post prandial blood glucose level after cinnamon supplementation which are in accordance with the work conducted by Khan *et al.*, (2003) who observed that cinnamon consumption (1, 3 & 6 gm) led to major reduction in fasting serum glucose (18-29%) in each of the cinnamon supplementation trial. The authors concluded that small amounts of cinnamon represent a safe and effective means to reduce the risk factors for the development of co-morbidities associated with the diabetes.

In a similar trial conducted by Ziegenfuss *et al.*, (2006) on diabetic adults in Germany, there were less pronounced, but still noteworthy results with a water-soluble cinnamon extract that was equivalent to 3 g/day of whole cinnamon powder. Their findings indicate that consuming cinnamon for 12 weeks leads to significant improvements in several features of the metabolic syndrome.

Similarly, a more recent trial was carried out in Sweden to study the effects of cinnamon on the gastric emptying time and blood glucose levels, They found that volunteers who ate rice pudding with cinnamon had far slower gastric emptying times than those who ate the rice pudding without cinnamon. In addition, those in the cinnamon group did not have the rapid rise in blood glucose levels than those in the plain rice pudding group (Mourot *et al.*, 2007). They concluded that cinnamon could reduce the sudden rise in blood glucose levels and metabolic syndrome, and this could be achieved by delaying the emptying of the stomach contents into the small intestine.

Khan *et al.*, (1990) have reported that an unidentified factor is present in cinnamon that potentiates the action of insulin in carbohydrate metabolism, they termed this factor as insulin potentiating factor (IPF). Broadhurst *et al.*, (2000) reconfirmed the presence of this factor in cinnamon. The hypoglycemic effect of cinnamon may or may not be like other hypoglycemic drugs. This unidentified factor increased the activity of insulin 3 fold in glucose metabolism in rat epididymal fat cell. Anderson *et al.*, (2006) characterized this unidentified factor present in cinnamon as Methyl Hydroxyl Chalcone Polymers (MHCP). They explained that MHCP made fat cells more responsive to insulin by activating the enzyme that causes insulin to bind to cells

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(insulin- receptorkinase) and inhibiting the enzyme that blocks this process (insulin receptor phosphatase) leading to maximal phosphorylation of the insulin receptor, which is associated with increased insulin sensitivity.

To summarize, this study provides evidence that cinnamon powder is effective in decreasing elevated blood glucose levels among adult men with Type 2 diabetes mellitus. Coupled with other recent research, the results of the present study demonstrate a positive effect on decreasing the raised fasting and postprandial blood glucose levels and glycated haemoglobin levels. It is recommended that diabetic individuals should use cinnamon as part of their food, on regular basis.

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