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Effects of Cinnamon on Blood Glucose Level and Lipid Profile in Syrian Type 2 Diabetes Patients

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ABSTRACT

Diabetes mellitus (DM) is one of the most common metabolic disorders that causes micro- and macro-vascular complication. The aim of this study was to evaluate The effects of cinnamon on fasting blood glucose (FBG), triglyceride (TG), total cholesterol (TC), and low density lipoprotein (LDL) in Syrian individuals with type 2 diabetes mellitus (T2DM). A total of 90 patients with type 2 diabetes (T2D), were randomized into two groups: one for placebo and one for treatment with cinnamon powder (*Cinnamomum cassia*), in daily amounts of 2 grams. We measured the patients' blood glucose and lipid levels under fasting conditions at the beginning of the study, and again at 30 days, the end of treatment.

The mean value of FBG level on the starting day before cinnamon intake was found to be 176.8 ± 9.6 mg/dl, and the mean values for lipids were TG 183.5 ± 15.5 mg/dl, TC 209.4 ± 7.8 mg/dl and LDL 119.4 ± 5.8 mg/dl. When diabetic patients were treated with the dose of 2 g cinnamon for 30 days, their mean FBG level dropped to 147.4 ± 8.9 mg/dl, TG 135.7 ± 9.6 mg/dl, TC 149.3 ± 8.6 mg/dl and LDL to 74 ± 6.2 mg/dl. No significant changes were noted in the placebo groups. The results of this study indicate that intake of 2 grams of cinnamon per day reduces serum glucose, TG, TC, and LDL and thus reducing the risk of diabetic complications.

Keywords: type 2 diabetes mellitus; fasting blood glucose; lipids; cinnamon

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INTRODUCTION

Diabetes mellitus (DM) is one of increasing worldwide incidence diseases. The total number of people with diabetes is expected to rise from 171 million in 2000 to 366 million in 2030. ¹⁾

The incidence of cardiovascular diseases is increased two- to fourfold in people with type 2 diabetes. ²⁾ Thus, control of hyperglycemia, and dyslipidemia is considered to be cornerstone in the strategy of management of diabetes and diabetic complications in type 2 diabetes mellitus.

In addition to adverse effects, treatment of diabetes mellitus with conventional drug therapies has poor outcome. Therefore, the search for more effective and safer hypoglycemic agents has continued to be an important area of active research. Hence, development of novel strategies to improve the outcome will be of great benefit.

Although the causes of type 2 diabetes are multifactorial, diet is known to play an important role in the incidence and severity of Type 2 diabetes and its cardiovascular complications.

³⁾ Changing the diet helps to prevent development of type 2 diabetes and to control blood glucose concentrations.

Many studies have focused recently on the health benefits of medicinal herbs and spices that have not only hypoglycemic effect in persons with diabetes, but also have effectiveness regarding lowering high levels of lipids. ⁴⁻⁶⁾

Spices such as cinnamon have been shown to have an insulin-like biological activity. ⁷⁻¹²⁾ The cinnamon insulin-mimetic was identified as a water-soluble polyphenol type-A polymer. ¹³⁾

Polyphenols within cinnamon showed to up regulate mouse adipocyte insulin receptors, ¹⁴⁾ and to inhibit the formation of advanced glycation end products in bovine serum albumin. ¹⁵⁾

In vitro and in vivo studies have been showed that cinnamon has a role on glycemic and lipidemic control, ¹⁶⁻²⁰⁾ however another trails

concerning cinnamon affects have produced conflicting results. ²¹⁻²³⁾

The present study was performed to find out the possible effects of cinnamon powder as anti-hyperglycemic and anti-hyperlipidemic herb in Syrian Type 2 diabetic patients.

MATERIALS AND METHODS

The study was conducted in Syria at Biochemistry and Microbiology department, Faculty of Pharmacy Ebla private University, Saraqib, Idlib, Syria; and was approved by the ethics Committee of the University of Ebla private University. All patients were informed about the study and a written consent was taken from all participants.

A total of 90 individuals with type 2 diabetes of both sexes 47 males and 43 females were recruited for participating in the current study. Only those diabetic subjects whose fasting blood glucose were in the range of 160-300mg/dl, and subjects with high lipids level were included in the study. Exclusion criteria included insulin use, consumption of non dietary cinnamon supplements, A1C <6.0%, and acute illness.

Enrolled individuals were were randomized into two groups: one for placebo (wheat flour) (45 patients) and one for treatment with cinnamon powder (*Cinnamomum cassia*) (45 patients), in daily amounts of 2 grams were administered orally in the form of capsules. Individuals were told to ingest four capsules immediate after lunch and dinner over 30 days period. Each capsule contained 250 mg product.

Venous blood samples were taken before breakfast for measurement of fasting blood glucose levels, lipid profiles, including triglycerides, total cholesterol, and LDL cholesterol at beginning and again at 30 days end of treatment.

The research did not suggest any alterations in other aspects of the

individual's medical care, diet, or exercise. The use of capsules, recorded data about changing drug, diet and Compliance were monitored by contact with the subjects.

Statistical Analysis

Collected data were tabulated and needed statistical analyses were done using descriptive statistic, means, and standard deviation (SD) of the means were calculated utilizing the computer data processing (SPSS, version 12). A probability value (P) of <0.05 was considered to be statistically significant.

RESULTS

A total of 90 patients, 47 males and 43 females, were included in the present study. The mean age of the patients was 54.6 ± 5.6 years. Of these, 45 (24 male, and 21 female) patients underwent treatment with 2 g of cinnamon (cinnamon group), and 45 (23 male, and 22 female) received 2 g of white flour (placebo group).

Statistical analysis did not show any differences between the two groups in the age, sex, body mass index and duration of diabetes (Table 1).

Table 1. Baseline Characteristics of the Patients

Variable	Cinnamon group (45)	Placebo group (45)
Age (years)	53.6 ± 6.4	54.9 ± 5.2
Sex (M/F) (%)		
Male	24 (53.3%)	23 (51.1%)
Female	21 (46.7%)	22 (48.9%)
BMI (kg/m ²)	29.1±2.9	28.4±4.1
Duration of diabetes (years)	7.2 ± 5.9	7.7 ± 5.3

Data are shown as mean ± SD or percentage; The groups did not differ with respect to any variable, P>0.05.

In our present study, the dose of 2 g cinnamon showed to induce a significant reduction in serum FBS, TG, TC, and LDL of Syrian diabetic individuals at the end of 30 days in comparison of the beginning day before cinnamon intake.

The effect of cinnamon on FBG and lipid levels of diabetic individual is shown in table 2. We observed no significant changes in fasting blood glucose levels and lipid profiles in placebo group (Data are not shown).

Table 2. Effect of cinnamon on fasting Blood Glucose and Lipids Levels of Diabetic Individuals.

Test	Before cinnamon consumption	After 30 days of cinnamon consumption	P value
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FBG (mg/dl)	176.8 ± 9.6	147.4 ± 8.9	< 0.05
TG (mg/dl)	183.5 ± 15.5	135.7 ± 9.6	< 0.05
TC (mg/dl)	209.4 ± 7.8	149.3 ± 8.6	< 0.05
LDL (mg/dl)	119.4 ± 5.8	74 ± 6.2	< 0.05

Data are shown as mean ± SD. Different is significant at the 0.05 level.

DISCUSSION

Hypoglycemic herbs are widely used as non-prescription treatment for diabetes. Cinnamon's impact on blood glucose and plasma lipid concentration have been the subject of several clinical trials; however, the issue of cinnamon intake's effect on blood glucose and lipid concentrations in people with type 2 diabetes still remains unclear.²²⁻²⁶⁾

The results of present study showed that, over 30 days, supplementation with 2 g of daily cinnamon lowers levels of glucose, triglyceride, total cholesterol, and LDL cholesterol of Syrian type 2 diabetic individuals. There were significant differences in FBS and lipids levels before and after consumption of cinnamon. The results were also showed that there were no significant changes for any of the individuals in the placebo groups.

Cinnamon has been shown to be generally safe when ingested. In our study, there were no adverse effects associated with the consumption of 2 g of cinnamon per day for 30 days.

Reduction of glucose and lipid concentrations after cinnamon intake might be related to presence of unidentified factor in cinnamon that potentiates the action of insulin in glucose and lipids metabolism. The unidentified factor in cinnamon was characterized as methylehydroxy chalcone polymers (MHCP) that function through increasing

phosphorylation of insulin receptors in fat cells, and so, it shows insulin-like properties.^{27, 28)} Some studies have shown that cinnamon, like insulin hormone, inhibits glycogen synthase activity.¹⁸⁾ Cinnamon has been shown to increase in-vitro glucose uptake and glycogen synthesis. In addition, cinnamon extracts are likely to aid in initiation of the insulin cascade system and insulin is also of crucial importance in lipid metabolism.^{9, 18)}

Dyslipidemia is one of the major risk factors for cardiovascular disease in diabetes mellitus. The characteristic features of diabetic dyslipidemia are a high plasma triglyceride concentration, low HDL cholesterol concentration and increased concentration of small dense LDL-cholesterol particles. The lipid changes associated with diabetes mellitus are attributed to increased insulin resistance and increased risk of CVD.²⁹⁾ cinnamon may have resulted in a decrease in insulin resistance and increased insulin sensitivity among the T2DM patients in this study.

Our study results were similar to the results were presented by other studies^{23, 26, 30)} but different from the results of others.^{25, 28, 31)} Comparing the result of this study with those of others and considering their limitations, we can point as the limitations of the present study its duration (30 days).

The results of this study showed positive effect of cinnamon supplementation on decreasing fasting blood glucose and lipids levels,

therefore, we conclude that supplementation with 2 gram/day of cinnamon in addition to normal diet and treatment schedule may be beneficial for those with T2DM to prevent and control diabetic complications.

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