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Effect of Cinnamon on Fasting, Two Hours after Meal Blood Glucose and Hb A_{IC} Of Diabetic Patient Type 2

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Abstract: The objective of this study is to detect the effect of cinnamon on diabetes mellitus type 2 to achieve this objective. Eighty diabetic patients type 2, on oral hypoglycemic bills, between 30 and 60 years old. 40 of them (25 female, 15 male) were given 1 gm of cinnamon for 40 successive days, and the other 40 (25 female , 15 male) given 1 gm of placebo for the same period with washing out period for both groups 20 days . Fasting and 2hrs after meal blood sugar were measured before starting cinnamon, after 20 day, after 40 day and after the washing out period 60th day using colorimetric method. Hb A_{IC} is measured before and in the 60th day of starting cinnamon using Nycocard Reader 11 (electrophoresis) method. All patients are interviewed before having cinnamon for their diet and daily activity with weekly assessment for this to insure that there is no change in diet as well as daily activity.Significant reduction in Fasting blood sugar (FBS), 2hrs after meal (2hrspp) in 40 th day of administration of cinnamon with the effect remaining till the 60th day , also Significant reduction in Hb A_{IC} values ,while no change in values of Fasting blood sugar (FBS), 2hrs after meal and Hb A_{IC} in the group taking placebo. Conclusion: cinnamon has a therapeutic effect on diabetes mellitus.
Keywords: cinnamon, diabetes mellitus, glucose

INTRODUCTION

Increasing interest in herbal and complementary medicine has led to a search for effective natural stuff that has significant medicinal values specially those stuffs within our kitchen. I along with other researcher are very interested in studying cinnamon as it is very precious for our elders**,** and throughout the history, especially regarding it is anti-diabetic effect, which has special importance in remote areas of Sudan, where it is v. difficult if not impossible, to have accessibility to medicines in the right time and keep them in proper conditions (insulin). Well controlled diabetes type 2 may make the patient never reach the insulin point

Cinnamon is imported to Sudan from china (cinnamon Casia) , beside it is a popular spice that can be added to food or drinks to give them an extra tasty flavor, It also has medicinal value that can have a positive effect on the body.
For instance, cinnamon has been found to have a positive impact on memory and brain function, has Anti-Clotting and Anti-microbial actions it's Calcium and Fiber protect against Heart Disease and improve Colon Health, is soothing for the stomach and may aid in ulcer prevention; suppresses bacteria that can lead to urinary tract infections and fungus related to yeast infections, has antioxidant effect[1-6].

Its flavor is due to an aromatic essential oil that makes up 0.5% to 1% of its composition. It is of a golden-yellow color, with the characteristic odor of cinnamon and a very hot aromatic taste. The pungent taste and scent come from cinnamicaldehyde or cinnamaldehyde (about 60 % of the bark oil) and, by the absorption of oxygen as it ages; it darkens in color and develops resinous compounds. Other chemical components of the essential oil include ethyl cinnamate, eugenol (found mostly in the leaves), beta-caryophyllene, linalool, and methyl chavicol[7-12]. Cinnamon bark is widely used as a spice. It is principally employed in cookery as a condiment and flavoring material. It is also used in many desserts recipes[13-16].

Cinnamon contains high levels of compounds called "polyphenols. Which has antioxidant activity, as in green tea, darkly colored berries, red grapes, some

nuts including peanuts, and dark chocolate[5,17,18-20]. A research by Roussel *et al*. supports the antioxidant effects of a water-soluble cinnamon extract (a preparation method that concentrates polyphenols) . Some recent studies suggest, for safety and better efficacy, that the water-soluble compounds in cinnamon are the most effective[5,7,21-23].

METHODS

Prospective study held in Ribat university hospital - Khartoum and Elmutkamil Health center – Omdurman in the period of August 2010 – October 2011, the results are analyzed in Ribat university hospital laboratories and Elmutkamil Health center laboratories – Omdurman

80 diabetic patients type 2, on oral hypoglycemic bills, between 30 and 60 years old , 40 of them (25 female , 15 male) were given1 gm of cinnamon for 40 successive days , and the other 40 (25 female , 15 male) administered 1 gm of placebo (grinded whole wheat)for the same period with washing out period for both groups 20 days . Fasting (Fbs) and 2hrs after meal (2hrspp) blood sugar , measured before administration of cinnamon ,after 20 day ,after 40 day and after the washing out period 60th day using colorimetric method, Hb A_{IC} is measured before and after the experiment using Nycocard Reader 11 (electrophoresis) method

All patients are interviewed before the starting cinnamon for their diet, and daily activities with weekly assessment, to insure that there is nether change in diet, nor in daily activities. Patients were, on hypoglycemic bills, with no change in medication during the test period

Preparation of cinnamon capsule

Cinnamon is bought from the main importers in Omdurman – whole sale market, backed in sealed containers, new, with the permissible limits of moisture, free of mold, etc.

Cinnamon is grinded and packed in size 0 elongated white capsules, each capsule contains ½ gm crude cinnamon.

Inclusion and Exclusion Criteria of volunteers:-

- Diabetic type 11
- Aging between 30 – 60 years old
- With no complication of diabetes
- Free from other diseases
- Taking only oral hypoglycemic bill
- Easy communicable
- Co-operative

RESULTS

The mean of fasting blood sugar before administration of cinnamon is found to be (204.9 mg/dl of blood), while it is (203.6 mg/dl of blood), (165.975mg/dl 0f blood), (167.175 mg/dl 0f blood), in the 20th ,40th and 60th day of administration of 1 gm of cinnamon respectively, With reduction 18 % between values before administration of cinnamon and40th of administration of 1 gm of cinnamon.

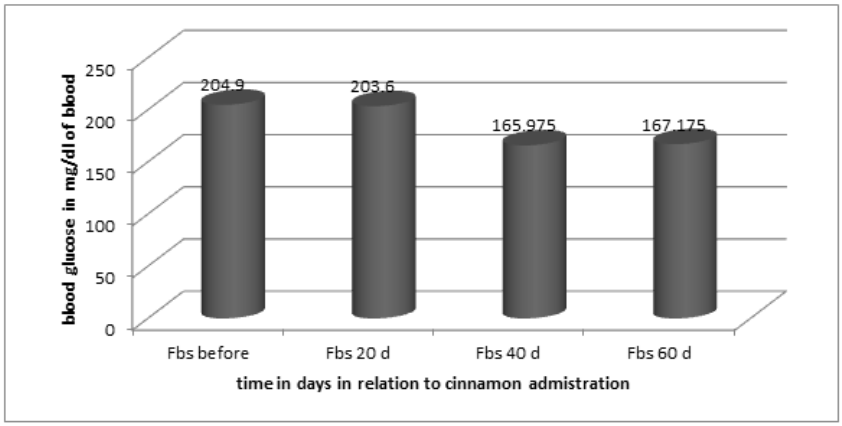

Fig-1: **The mean Fasting blood sugar of diabetic patients type 11 taking 1 gm of cinnamon**

On the other hand , the mean of fasting blood sugar before administration of placebo is found to be (185mg/dl of blood), while it is (182.45 mg/dl of blood) , (184.575mg/dl of blood) , (184.525mg/dl of blood) ,in the 20th ,40th and 60th day of administration of 1 gm of placebo respectively . Fig (2)

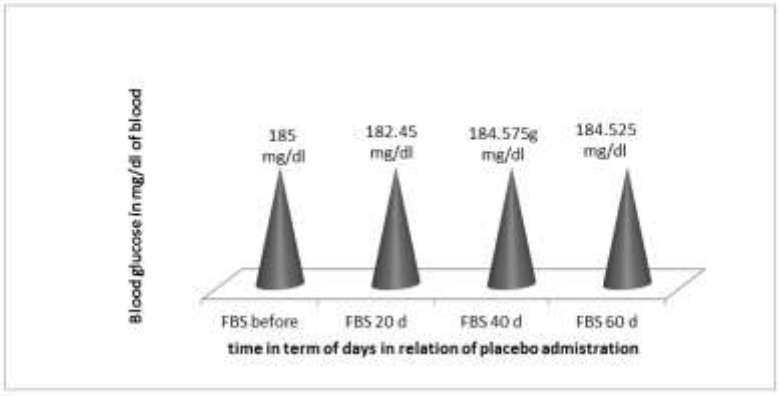

Fig-2: The mean fasting blood glucose of diabetic patients taking (1 gm of placebo)

The mean blood sugar 2 hrs after meal, before administration of 1 gm of cinnamon is found to be (246 mg/dl of blood), while it is (245.25 mg/dl of blood) , (196.5385 mg/dl of blood) , (197.375 mg/dl of blood) ,in the 20^{th} ,40^{th} and 60^{th} day of administration of 1 gm of cinnamon respectively. Fig (3).

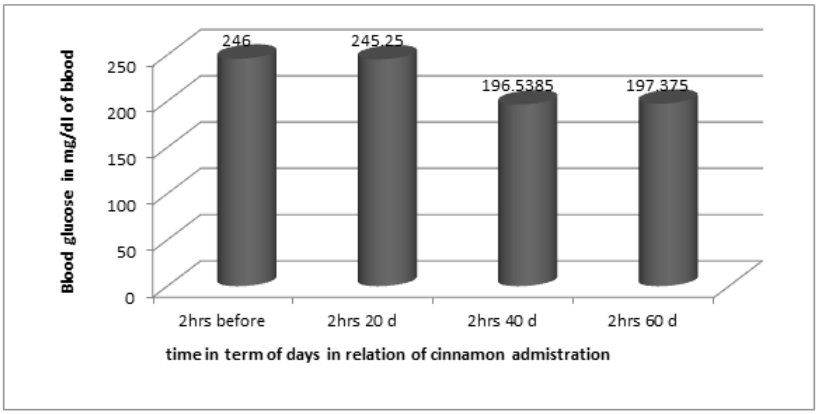

Fig-3: The mean 2hrpp blood glucose of diabetic patient's type 2 taking (1 gm of cinnamon)

The mean blood sugar , 2 hrs pp before administration of placebo is found to be (227.4 mg/dl of blood), while it is (229.45 mg/dl of blood) , (227.025 mg/dl of blood) ,(226.875mg/dl of blood) ,in the 20^{th} ,40^{th} and 60^{th} day of administration of 1 gm of placebo respectively Fig (4)

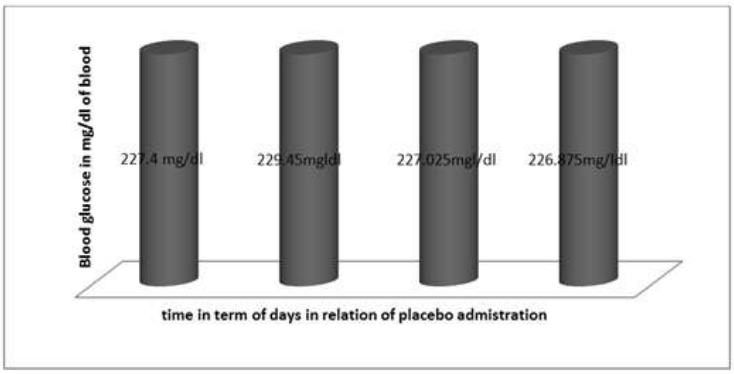

Fig-4: The mean 2hrpp blood glucose of diabetic patients taking (1 gm of placebo)

The mean Hb A_{IC} is found to be (9.98%) before administration of cinnamon, while it is (8.755%) after the end of the experiment with 12.22% reduction Fig (5)

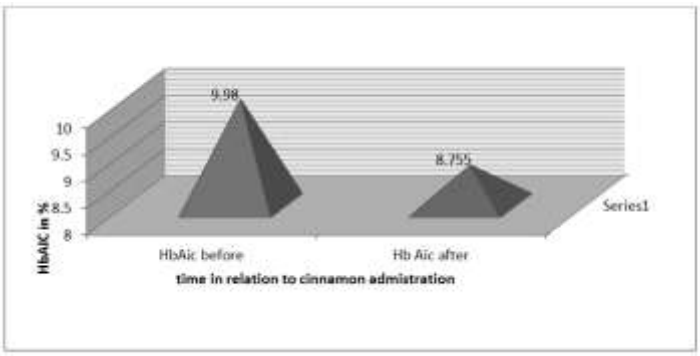

Fig-5: The mean HbA_{Ic} of diabetic patients taking (1 gm of cinnamon)

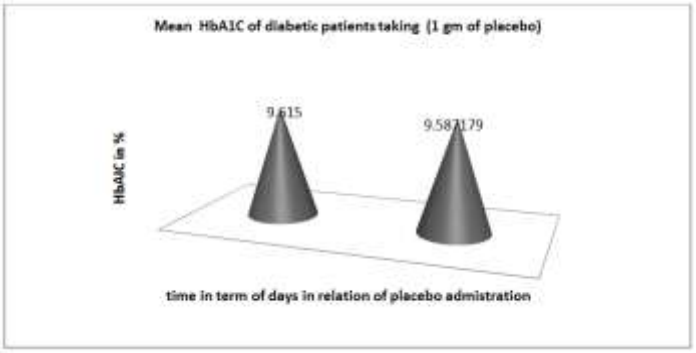

Fig-6: The mean Hb A_{IC} is (9.615) before administration of placebo, while it is (9.587179) after the end of the 60th day

DISCUSSION

Although the door of cinnamon has been knocked before, but it is Anti- diabetic effect remains controversial till now, May be because of the no. of the samples?, the ethnic back ground?, the socioeconomic status of the type of the population upon whom this study has been held? I don't know, but it remains a challenge to me along with other interested researchers. Which pushed me strongly to conduct this study.

According to the analysis of my results, cinnamon is significantly reduces blood glucose, either fasting (18 % reduction) or 2hrs after meal, 20.3% reduction, which is reflected upon Hb A_{IC} (12.22% reduction), in 40th day of administration of cinnamon and ongoing to the 60th day

My % in reduction of glucose values is less than khan stated 29%.,the Pakistani researcher who did the first significant clinical study evaluating Cinnamon, published in 2003[1]. In his trial, 30 Pakistani participants took Cinnamon (Cinnamon cassia) he reported significant reductions in fasting blood after 40 days of having whole cinnamon orally at three different doses (1, 3, or 6 grams per day) he studied the effect of each dose on only 10 patients

Khan samples are too little plus that, Some researchers refer this results, khan obtained to the low polyphenols intake of Pakistani people (low socioeconomic status) .which present in addition to cinnamon, in green tea, darkly colored berries, red grapes, some nuts including peanuts, and dark chocolate[17-19].

Mang, *et al*. who published in 2006, evaluated a water-soluble extract, corresponding to 3 grams of cinnamon, - not like mine, whole crude cinnamon- in 79 German participants with type 2 diabetes , but Mang let his participants to continue having cinnamon for four months. Fasting glucose was lowered by about10%. Only, but he found no significant changes in hemoglobin A1C7[20-23].

While Suppapitiporn *et al*. who has published in 2006, had clinical trial, on 60 Thai participants with type 2 diabetes took 1.5 grams per day of encapsulated whole cinnamon powder or placebo for 3 months. At the end of the trial period, no significant changes were evident in either fasting glucose, hemoglobin A1C. There was suggestion that a greater percentage of patients in the cinnamon group achieved glucose "control" (i.e. reached a hemoglobin A1C value of < 7%), however this difference was not statistically significant[8].

In 2007, Altschuler *et al*. published that he found no significant changes in hemoglobin A1C, in trials done on 72 adolescents with type 1 diabetes [11]. On the other side Crawford *et al.* who published a clinical trial on 109 US adults with Type 2 diabetes, using 1 gram/day for 3 months *of Cinnamon cassia;* whole herb he registered Significant 0.5% reduction in HbA1c[17-19].

In 2007 Blevins *et al*. published the results of their clinical trial performed in the United States. In their study, 60 participants with type 2 diabetes and very stable medications were randomly assigned to take cinnamon (1 gram per day) or placebo for 3 months. At the end of 3 months, there were no significant changes in fasting glucose, hemoglobin A1C, insulin sensitivity or lipid values [11, 20, 21]. Solomon *et al*. mentioned that Cinnamon contains a phytonutrient called methylhydroxychalcone polymer (MHCP), which has been shown to aid in maintaining healthy blood sugar levels already within the normal range.

They continued their translational research evaluating the effects of high dose cinnamon powder on insulin sensitivity in healthy adults by evaluating the effects of sustained short-term intake (3 grams per day or placebo for 14 days) on glucose and insulin measures also following OGTT. In this study, cinnamon reduced blood glucose following the OGTT, reduced insulin response to the OGTT and improved insulin sensitivity compared with the placebo. However, the effects were lost almost immediately upon stopping the cinnamon extract[16,22,23].

Dr. Crawford published a clinical trial, evaluating the impact of whole-herb cinnamon (Cinnamon cassia, 1 gram per day for 3 months) vs. placebo in 109 patients with type 2 diabetes recruited from three primary care clinics on a US military base. Cinnamon was added to normal medications and with no medication changes during the study, there were no meaningfully difference between groups at the end of the study. In this clinical trial, a 0.5% greater reduction in hemoglobin A_{1c} was evident in the cinnamon group compared to the placebo group; this finding was highly statistically significant. This trial is notable for several reasons, including its size (the largest randomized trial performed thus far) and its "Western" participant group from a typical clinical practice setting[17,24].

CONCLUSION

According to this study cinnamon is an anti-diabetic agent ,significantly reduces blood glucose, either fasting or 2hrs after meal, as well as Hb $A_{IC,}$ and it is not necessary to be taken on daily base as the effect continued when cinnamon is stopped for 20 day washing after the continuous administration for 40^{th} day .

RECOMMENDATIONS

- Further study is needed on cinnamon involving larger No. of volunteers.
- More work is needed regarding cinnamon mode of action, including determination of insulin hormone level before and after administration of cinnamon.

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