Comparison between 70% aquaethanolic cinnamon extract effect and glimepiride on blood glucose levels among alloxan-induced diabetic rats

Hager Siddeg A. Almageed[1], Tarig Mohamed Fadl Elmula[2]

[1]*Algaaly Health center, Omdorman-Sudan*

[2]*Department OF Chemical Pathology, Faculty of Medical Laboratory Sciences, University of Khartoum-Sudan*

Abstract:

Background: Diabetes mellitus is a chronic, metabolic disorder characterized by elevated levels of blood glucose which leads over time to serious damages to the heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 which occurs when the body becomes resistant to insulin or cannot produce enough insulin (1). Cinnamon (Girffa) extract is known to reduce postprandial glycemia by stimulating insulin action to uptake glucose by the cells.

Methodology: It was an experimental study performed on 20 albino rats weigting 150 to 200 gms. On 15 of them diabetes was induced using alloxan .After fasting for 8 hours, basal blood glucose was measured and all rats were given standard meal and then the effect of 250mg/kg, 500mg/kg of 70% aquaethanolic extract of cinnamon on blood glucose level one and two hours thereafter was compared with the effect of glimiperide.

Results: Cinnamon aquaethanolic extract in a dose of 250mg/kg reduced glucose concentration significantly (p=0.043) by 25% after one hour and by 11% after two hours. When a dose of 500mg/kg was given, the glucose level was reduced by 19% and 11% after one and two hours respectively (p=0.002, and 0.005). No adverse effect was noticed. Cinnamon extract was as effective as glimiperide.

Conclusion: These findings suggest that cinnamon extract may be used as a natural postprandial hypoglycemic agent.

***Corresponding author:** Department Of Pathology, Faculty of Medicine, University of Khartoum. Email: bashayerzein@gmail.com*

Introduction

Diabetes mellitus is a metabolic disorder that affects metabolism of glucose leading to elevated blood glucose. There are 2 types: type 1 also called insulin-dependent diabetes mellitus and this is because the body cannot produce insulin; and type 2 also called non- insulin dependent diabetes mellitus or insulin-resistant, where insulin is present but the body cells are resistant to its action(1). Postprandial hyperglycemia control has been a challenge that faces patients with type 2 diabetes. Cardiovascular disease, one of the major complications of diabetes, is largely influenced by glycemic measures(2). Cinnamon(girffa) has become a natural product of interest because it has been hypothesized to provide health benefits, such as its ability to lower blood glucose. It has been suggested that the modality by which cinnamon exerts its effect on blood glucose can be attributed to its active component cinnamaldehyde (3).

The hypoglycemic effects of cinnnamaldehyde have been investigated before and were thought to be due to promoting insulin release; enhancing insulin sensitivity; increasing insulin disposal; and exerting activity in the regulation of protein-tyrosine phosphatase 1B (PTP1B) and insulin receptor kinase(4-6).

Materials and Methods:

This study was done in Alahfad University for Women-Omdurman, between January 2016 and April 2016. The study included 20 albino rats weighing 150-200gms, five of them were used as control and fifteen were the diabetic (study group). Diabetes was induced using alloxan.

Cinnamon Extract : Cinnamon extract tested in this study was prepared as 70% aquaethanolic extraction. The method of extraction was (macerator method[7]: 100gms of dried cinnamon powder were added to 2 liters of 70% ethanol and kept overnight, then the mixture was filtered to remove solid large particles using Buchner flask and vacuum pump (Buchner apparatus). The suspension was evaporated to obtain concentrated extract, then dried in the hot oven at 80°C.

In vivo inhibition of pancreatic insulin: inhibition of insulin production was induced by introducing alloxan (from Labal Chemi- India). Alloxan is a chemical powder that causes partial destruction of B-cells in the pancreas causing hyperglycemia to the rats. The dose given to the rats was 130mg/kg of rat dissolved in 10ml normal saline. The rats were made to fast for 18 hours. Baseline blood samples were drawn and then alloxan was injected into the back of the neck and then the rats ate their libtium. After 72 hours they were tested for fasting blood glucose to show hyperglycemia which was defined as blood glucose more than 200 mg/dl.

All blood samples were taken from their eyes after anesthesia by chloroform wet cotton. The samples

were collected into fluoride oxalate anticoagulated vacutainers .

The trial: the study was performed on 3 groups of diabetic rats. Group 1: Five diabetic rats were treated with glimepiride (5mg tabs) in a dose of 20mg/kg.

Group 2: Five diabetic rats were treated with cinnamon extract of conc. 250 mg/kg.

Group 3: Five diabetic rats were treated with cinnamon extract of conc. 500 mg/kg.

All rats were made to fast for 8 hours and blood samples were collected at zero time (before giving the medication) and at one and two hours postprandial. The meal was composed of:sorghum, sugar, salt and water, and medications were given by a feeding tube.

Results:

Twenty rats were included in this study. The mean fasting blood glucose in all rats before induction of diabetes was 79mg/dl.

Table I shows the mean concentration of blood glucose in the study group at fasting, one and two hours after giving the medication. There was no significant difference between the effect of glimepiride and cinnamon extract. Secondly, the cinnamon extract on a dose of 250mg/kg showed a rapid effect and similar to a dose of 500mg/kg.

The dose response to cinnamon extract for the first hour postprandial showed rapid decrease in blood glucose of 23% (P.=0.043), and 19.5%, (P=0.002) in doses 250mg/kg and 500mg/kg respectively, and a decrease of 11% (P=0.242) and 8% (p.=0.005) in same doses after 2hours. Whereas the glimepiride group showed a decrease of 13.9% (p=0.62) in the first hour and 17% (p=0.024) in the second hour.

Table I. shows the mean concentration and percentage decrease of blood glucose in the study groups at baseline, one, and two hours after giving medication.

Group	Fasting	Blood glucose conc. and % decrease after 1hr	Blood glucose conc. and % decrease after 2hr	p.value
1/ 250 mg/kg	262mg/dl	202mg/dl 23%	233mg/dl 11%	1hr: p=0.043 2hr: p=0.242
2/ 500 mg /kg	223mg/dl	180mg/dl 19%	250mg/dl 8%	1hr: p=0.002 2hr: p=0.005
3/ Glimepiride 20mg /kg	228mg/dl	196mg/dl 13.9%	189mg/dl 17%	1hr: p=0.062 2hr: p=0.024

Discussion:

Our study showed that alloxan induces hyperglycemia in rats as we compared blood glucose before (mean=79mg/dl) and after (mean=234mg/dl) alloxan induction which was statistically significant.

Cinnamon extract in a dose of 250mg/kg showed significant reduction in blood glucose by 23% (p=0.024) after one hour and by 11% after two hours. So the peak action occured after one hour and its action is relatively short-lived.

After using of 500mg/kg cinnamon extract, blood glucose dropped after 1hour by 19% (p.=0.002) and by 8% after 2hours (p.=0.005) and both were statistically significant. So though cinnamon in a dose of 500 mg/kg reduced blood glucose, its effect was not more profoundly significant than a lower dose of 250mg/kg.

When comparing the effect of 250mg/kg and 500mg/kg of cinnamon extract with the effect of glimepride, the effect was not statistically significant (p=0.637).

Similar reduction in blood glucose level using extracts of cinnamon were shown by other workers who suggested various mechanisms for this effect including enhancement of insulin secretion by beta cells of the pancreas,; reduction of glycemic response to starch in normal rats by inhibiting pancreatic α amylase digestion[1,6].

Conclusion:

This study showed that aquaethanolic cinnamon extract in a dose of 250mg/kg and 500mg/kg could reduce 1hour and 2hours postprandial glucose level in rats, comparable to the effect of oral hypoglycemic drug glimepiride. However, increasing the dose to 500mg/kg did not increase its effect.

Acknowledgment:

We would like to thank Dr Adil Naser Shafee and Alahfad University School of Pharmacy staff for their great help in this trial.

Refernces:

1. WHO (2016). www.who.int/diabetes/en/ diabetes program 2016/4/3 1:32 pm.

2. Robert W. A, Emmanuelle S, William L B, Craig I. C,,Olivia J. Cinnamon use in type 2 diabetes: an updated systematic review and meta-analysis, annals of *familf medicine* ,2013,11: 452-459,

3. Vickram BJ, Marie P-Izard, Cyril M, etal. Acute effect of Ceylon cinnamon extract on postprandial glycemia: alpha-amylase inhibition, starch tolerance test in rats, and randomized crossover clinical trial in healthy volunteers. *BMC complementary and Alternative Medicine* 2014,14;351-362.

4. Priyanga R, Sanja , Mangala G . et.al , Effects of cinnamon zeylanicum (Ceylon cinnamon) on blood glucose and lipids in a diabetic and

healthy rat model *Pharmacognosy Res*, 2012,4; 73–79

5. Dr. Muhammad S K, Dr. Aneela Q, Dr. Shuja A K,. et.al , Effects of cinnamon extract in diabetic rat models in comparison with oral hypoglycemic drugs. *The Professional Medical Journal* 2014,21;717-722

6. Hammad, A.Husni M M. Saleh J, K. Malika N, Impact of Cinnamon Extract on Hyperlipidemic and Diabetic Rats. Faculty of Science University of Duhok, Duhok, Iraq , *International Journal of Chemical and Biomolecular Science,* 2015,1; 96-106.

7. http://www.herbs-info.com/what-are-macerations.html 2016/1/27 10:25 am