

Glucose Lowering Potential of Cinnamomum Cassia Bark Extract in Induced Diabetic Wistar Albino Rat Model

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ABSTRACT

Objective: To determine the effects of Cinnamomum cassia bark extract (CCBE) on β -cell of islets of Langerhans as evaluated by serum insulin and blood glucose in alloxan-induced diabetic rat model.

Study Design: Experimental study

Duration of Study: December 2013 to October 2014

Material and Methods: Sixty Wistar albino rats of both genders were selected according to inclusion and exclusion criteria and were divided into 6 groups. Each group is further subdivided into two groups. Diabetes mellitus (DM) was induced by giving single intra-peritoneal administration of alloxan monohydrate 150mg/kg body weight. CCBE was given for 6 weeks orally. Blood glucose and serum insulin were measured by standard laboratory methods. Data was analyzed on SPSS 21.0. A significant p-value was defined as ≤ 0.05 .

Results: CCBE showed statistically significant glucose lowering effect. A rise in serum insulin was observed in CCBE treated diabetic rats in particular the rats which received high dose (6 grams).

Conclusion: Cinnamomum cassia bark extract showed glucose lowering potential and insulin secretion augmenting activity.

Key Words: Cinnamomum cassia, β -cell of islets of Langerhans, Serum insulin, Blood glucose, Alloxan-induced diabetic rat.

INTRODUCTION

Globally Diabetes mellitus is serious and sensitive health problem and it is increasing day by day. This involves many systems and organs problem viz; Blood pressure, cardiovascular events, Lipids, renal failure etc. Herbal therapy is being used since the birth of civilization.¹⁻³ Traditionally used for gastric problems and inflammatory disorders besides other herbs like clove, turmeric, innamomum herb is one of the herb also being used for treatment of Diabetes

mellitus. As difficulty in availability of human volunteers, the researchers have diverted their research on animals under controlled conditions.⁴⁻⁵ It is also easy to induce diabetes mellitus in an animal model. Normally at present, cinnamon is being used for flavor and tastes since last decades. Its importance in the treatment of Diabetes Mellitus is initiated.⁶⁻⁸ Realizing its importance, researchers are engaged all over the world beside it in maintaining glucose homeostasis has also other side benefits viz; lipid metabolism and as antioxidant. Cinnamon gets release of GLP and GIP. These both release of insulin and repair damaged β cells of Langerhans. It also maintains Glucose tolerance, insulin insensitivity and insulin release.⁶⁻¹⁰ The present study was designed to determine the effects of Cinnamomum cassia bark extract (CCBE) on β -cell of islets of Langerhans as evaluated by serum insulin and blood glucose in alloxan-induced diabetic rat model at animal house of Isra University.

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MATERIALS & METHODS

Sixty Wistar albino rats of both genders were selected according to inclusion and exclusion criteria and were divided into 4 groups. Animals were kept at standard room temperature with 12 hour dark-light cycles, free access to feed and chow. Animals were divided into Group A. controls, Group B. Diabetic controls, Group C. CCBE 3 g/day and Group D. 6 g/day for Six weeks. Blood was collected from rat tail vein. Blood glucose was estimated by glucose oxidase method on Hitachi Chemistry analyzer (Roche Diagnostics', USA). Serum insulin was detected by ELISA method (Sigma, Aldrich, USA). Diabetes mellitus (DM) was inducted by giving single intra-peritoneal administration of alloxan monohydrate 150mg/kg body weight. Data was analyzed on SPSS 21.0. Continuous variables were analyzed by ANOVA with post Hoc testing (Tukey Cramer test). A significant p-value was defined as =0.05.

RESULT

The present study was an experimental study conducted at animal house of Isra University. The primary goal of study was to determine the effects of Cinnamomum cassia bark extract (CCBE) on-cell of islets of Langerhans as evaluated by serum insulin and blood glucose in alloxan-induced diabetic rat model. CCBE showed statistically significant glucose lowering effect. A rise in serum insulin was observed in CCBE treated diabetic rats in particular the rats which received high dose (6 grams). Cumulative results for blood glucose and insulin in table I and II. Blood glucose lowering activity of CCBE was observed and insulin levels were found elevated in CCBE animals compared to controls.

Table-1: Blood Glucose (mg/dl) Animal Group (n=60)

Groups	Mean	SD	p-value
Group A. Controls	141.6	35.1	<0.001
Group B. Diabetic control	271.6	63.1	
Group D. CCBE (3g/day)	235.0	51.8	
Group E. CCBE (6g/day)	203.0	32.8	

CCBE Cinnamomum cassia bark extract

Table-2: Serum Insulin (uU/ml) in Animal Groups (n=60)

Groups	Mean	SD	p-value
Group A. Controls	16.2	5.6	<0.001
Group B. Diabetic control	5.2	1.2	
Group D. CCBE (3g/day)	8.15	1.01	
Group E. CCBE (6g/day)	10.53	2.13	

CCBE Cinnamomum cassia bark extract

DISCUSSION

Cinnamomum cassia is a culinary spicy herbal agent used since centuries back. Cinnamon use for lowering plasma glucose has been known since ancient days. Use of Cinnamon as medicine dates back 5000 years approximately, when it was primary used for stomach and digestive problems, as appetizer, as anti nauseating, anti-gas, anti-spasmodic, anti flatulent, and for diarrhea^{10,11}.

Recent reports had claimed of glucose regulatory effects exerted by Polyphenols, in particular "Polyphenol A"^{2,7,12}. A search of pubmed, Medlip, Google scholars & a number of websites revealed limited number of literature on the effects of Cinnamomum cassia on blood glucose levels in diabetes mellitus in both animal and human studies. Cinnamomum cassia is reported in a few clinical trials and animal studies, of possessing glucose regulating effects & antioxidant effects.¹²⁻¹⁵

Kamble, et al¹³ (2013) recently performed an experimental study in alloxan induced albino diabetic rats at Al-Ameen Medical Collage, Karnataka, India to investigate the effects of cinnamomum cassia on glucose homeostasis. Study compared effects of aqueous extract of cinnamomum cassia (60mg/kg), glibenclamide (5 mg/kg) and Metformin (0.5gm/kg) in diabetic rats. All the agents under study were given orally as single morning dose. Fasting blood glucose was checked on days 0, 10 and 15. Study reported that the aqueous extract of innamomum cassia (60 mg/kg) alone produced significant effects on glucose homeostasis compared to glibenclamide and metformin (p<0.05). Similar are the results of present study as CCBE exerted glucose lowering effect in rat model. Kim et al¹⁴ (2006) had reported

similar effects of CBBE on glucose homeostasis in type 2 diabetic db/db mice model. Significantly positive effects on glucose homeostasis were observed and it was concluded that the CCBE exerts its blood glucose lowering effects through insulin-mediated glucose regulation hence glucose homeostasis was maintained.

Several recent studies¹⁵⁻¹⁷ reported that the "Cinnamon oil" and "Polyphenolic oligomers" extracts had shown promising hypoglycemic, hypolipidemic and anti-oxidant activities in streptozotocin induced diabetic rat models.^{2,18} The findings are in agreement with present study. CCBE proved more effective in present study. Overall, blood glucose lowering and insulin secreting activity of Cinnamomum cassia bark extract was proved in present study.

CONCLUSION

It is concluded that the Cinnamomum cassia bark extract regulates blood glucose primary through augmentation of insulin secretion from β -cells of islets of Langerhans.

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