

Comparison of the Anti -Diabetic Effect of Aqueous Extract of Cinnamon (Cinnamomum Cassiae) With That of Glibenclamide on Streptozotocin Induced Diabetic Rats

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Abstract: Background: Diabetes mellitus is a metabolic disorder in which a person has high blood sugar either because the pancreas does not produce enough or because of relative insensitivity of insulin. Cinnamon extract decreases blood glucose level of some experimental animals by increasing glucose uptake in adiposities and by increasing sensitivity of insulin.. Searching to evaluate the anti-diabetic effect of cinnamon (Cinnamomum cassiae) with glibenclamide in experimentally induced diabetic rats.**Aim:** To find out the anti diabetic effect of aqueous extract of cinnamon (Cinnamomum cassiae) and compare it with a established anti-diabetic drug (Glibenclamide) in streptozotocin induced diabetic rats.**Method:** This was a experimental study conducted in the department of Pharmacology, Dhaka medical college & Hospital from July 2015 to June 2016. Sample size was 30.The study was desined as 2 parts: Experiment-1 & Experiment – 2. **Result:** Cinnamon produces no statistically significant effect on blood glucose level of non-diabetic rats (P- value >0.10; which is not significant).Cinnamon significantly reduced blood glucose level of streptozotocin induced diabetic rats. There is no statistically significant difference between cinnamon and Glibenclamide on blood glucose lowering effect in streptozotocin induced diabetic rats(P – value >0.10; which is not significant).**Conclusion:** The study was conducted to find out anti diabetic effect of cinnamon on experimentally induced diabetic rats. The present study found that cinnamon (Cinnamomum cassiae) significantly lowers blood glucose level in experimentally induced diabetic rats. So cinnamon can be used as alternative anti-diabetic medicine for its easy availability, cost effectiveness and as well as lack of significant side effects.

Key words: Diabetis, Cinnamon, Glibenclamide, Streptozotocin

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I. Background

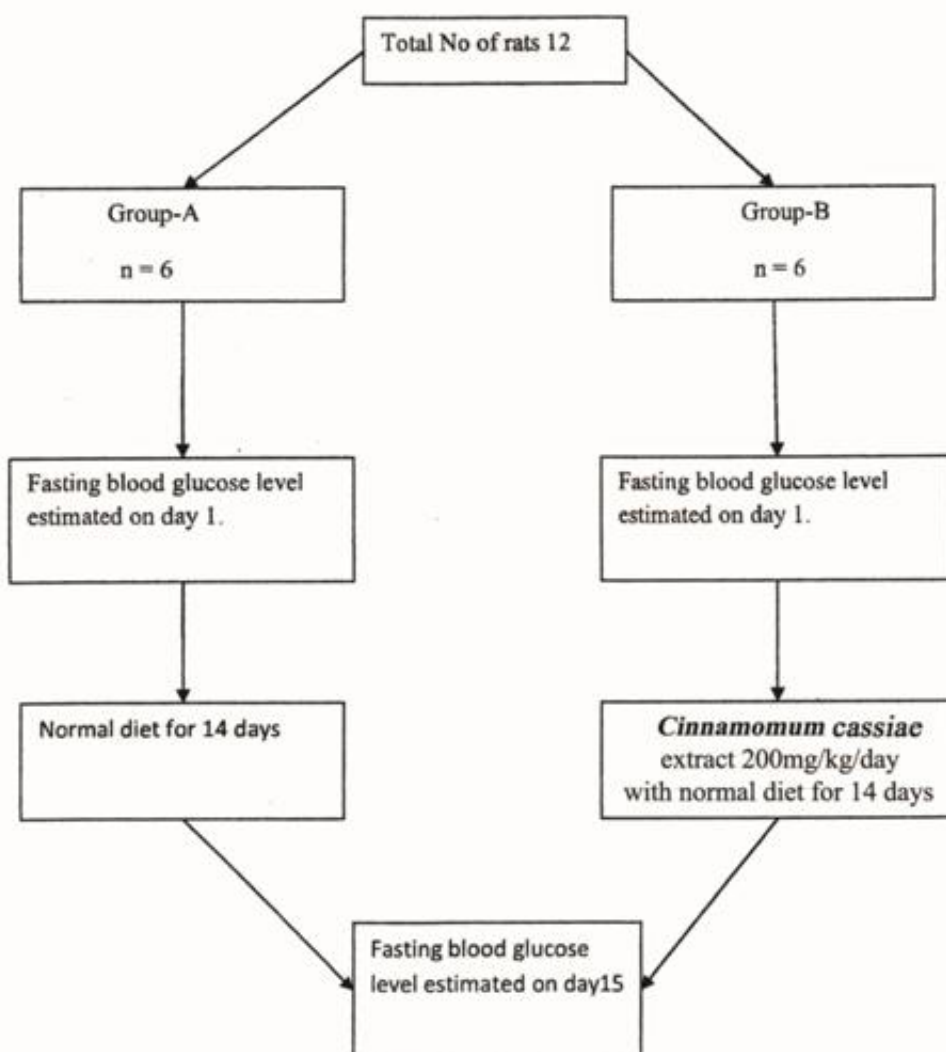
The word Diabetes comes from ancient Greek word ‘Diabete’ which means “ a passer through a siphon”^[1]. Diabetes mellitus is a metabolic disorder in which a person has high blood sugar; either because the pancreas does not producing enough insulin, or because cells does not responds to the insulin that is produced by body^[2]. High blood sugar produces the classical symptoms of polyuria, polydipsia and polyphagia. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute life threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the non ketotic hyperosmolar syndrome. Long term complication of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcer and autonomic neuropathy causing gastrointestinal, genitourinary, cardiovascular and sexual dysfunction^[3]. Regarding diabetes treatment, no suitable drug is yet to be available which can permanently cure this disease. Since discovery of insulin in 1922, it has been used successfully. but Insulin cannot be given orally and daily intake of Insulin is really troublesome. Hypoglycemic reaction is an adverse effect that may occur in any diabetic treated with insulin. Insulin resistance is a state of relative tissue insensitive to the action of insulin which is another drawback for patient taking insulin for a long time. On the other hand, modern oral anti diabetic drugs are costly and are to be continued lifelong. They have adverse effects as well^[4]. Plants have been used for treatment of diabetes since 1550 BC^[5]. Spices have been used since ancient times not only for increasing the flavor of foods but also for their preservative and medicinal properties^[6]. A number of spices and herbs have a long history of traditional use in treating elevated blood sugar levels. Cinnamon (Cinnamomum cassiae) is one of the traditional folk herbs used for treatment of diabetes mellitus^[7]. Cinnamon extract decreases blood glucose level of some experimental animals. It also increases sensitivity of insulin and glucose uptake in adiposities^[8]. With this background information, in the present study, it was attempted to compare the anti – diabetic effect of

cinnamon (*Cinnamomum cassiae*) with an established antidiabetic drug (glibenclamide) in experimentally induced diabetic rats.

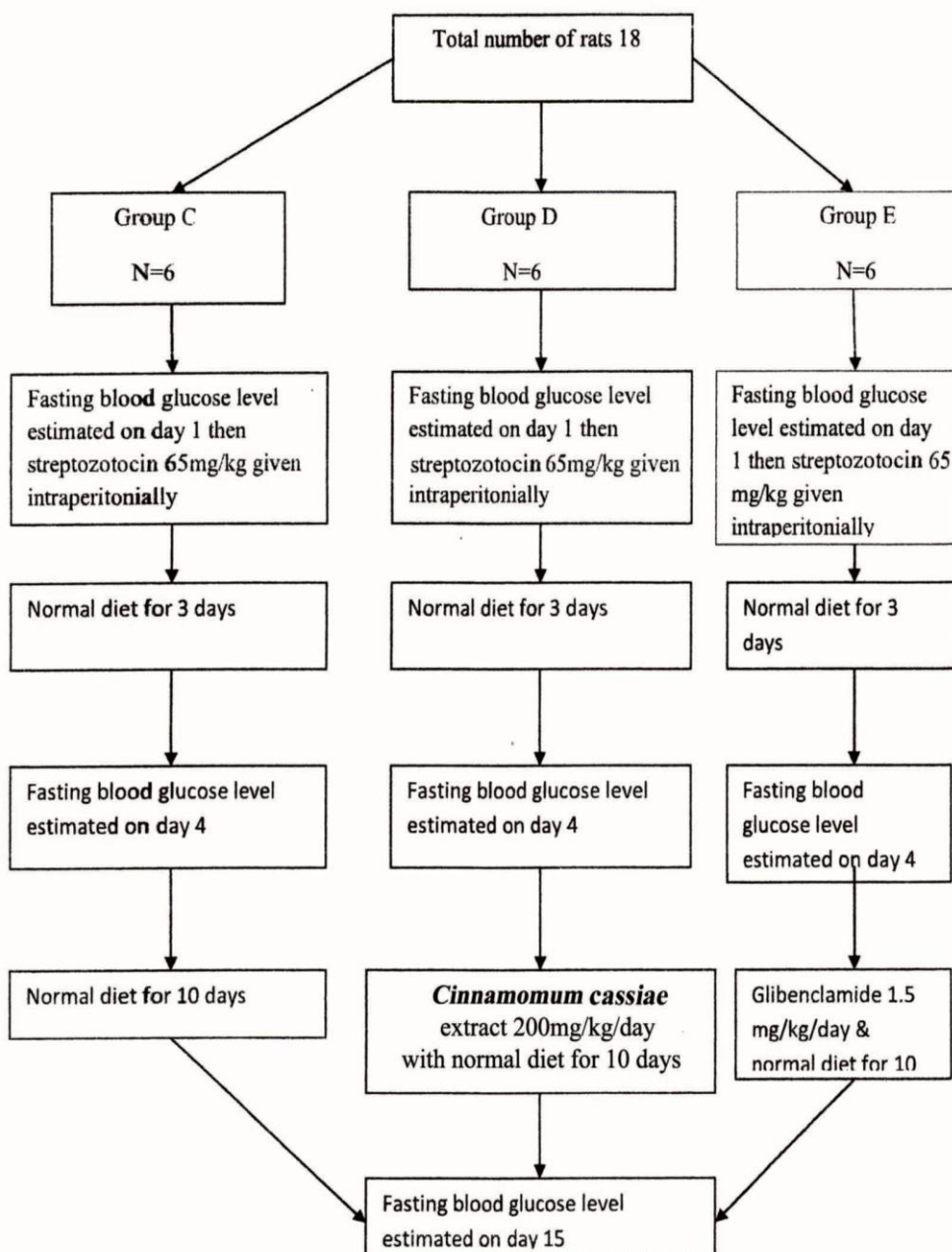
II. Methods

This was an experimental study conducted in the department of Pharmacology, Dhaka medical college & Hospital from July 2015 to June 2016. Sample size was 30. The study was designed as 2 parts: Experiment-1 & Experiment-2. The experiment was carried out on a total number of 30 long Evans Norwegian strain rats of both sex, weighing between 140-150 gram and age between 8-10 weeks. Total number of rats are divided into 5 groups. Group (A-E). Group (A,C) used as Control group & group (B,D,E) used as experimental group. Cinnamon powder was obtained from cinnamon bark, & powder was produced by crushing sun dried cinnamon bark in a grinder machine. Aqueous extract of Cinnamon was made in the Drug Research laboratory of Center for advanced research of sciences (CARS) of Dhaka University. Blood glucose estimation was done by electronic glucometer. Data was analyzed with the help of a computer by a statistical program SPSS. Unpaired “t” test was applied for data analysis and compared with 95% confidence interval taking p- value ≤ 0.05 as significant.

Experiment-1:



Experiment-2:



Design of experiment 2

III. Result

Table – I: Effects of aqueous extract of cinnamon (*Cinnamomum cassiae*) on blood glucose level of non diabetic rats.

Group	FBG (mmol/L) on day 1 (Mean± SD)	FBG (mmol/L) on day 1 (Mean± SD)	p - value
A (n=6)	5.30± 0.37	5.30± 0.25	>0.10 ^{ns}
B (n=6)	5.10± 0.34	5.20± 0.41	

Table – I shows cinnamon produces no statistically significant effect on blood glucose level of non-diabetic rats (P- value >0.10; which is not significant).

Group – A = Standard normal diet was given for 14 days

Group – B = Aqueous extract of cinnamon 200mg/kg/day was given for 14 days

Results were obtained through unpaired student’s “t” test.

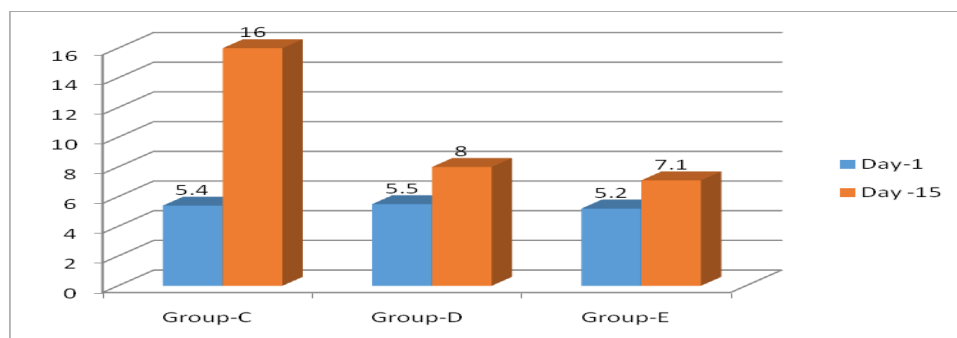
Table – II : Effects of streptozotocin on blood glucose level of group C,D and E rats on day 4.

Group	FBG (mmol/L) on day 1; before streptozotocin (Mean± SD)	FBG (mmol/L) on day 4; after streptozotocin (Mean± SD)	p - value
C (n=6)	5.40± 0.21	15.00± 3.33	>0.10 ^{ns}
D(n=6)	5.50± 0.44	15.10± 3.19	
E(n=6)	5.20± 0.45	14.80± 3.32	

Group – C, D& E = was given streptozotocin 65 mg/kg intraperitoneally

Results were obtained through unpaired student’s “t” test

Table – II shows streptozotocin produces no statistically significant difference on blood glucose level of group C,D & E rats on day 4 (P- value >0.10; which is not significant).



Group - C rats were given standard rat diet for 14 days

Group – D rats were given cinnamon 200 mg/kg/day for 10 days

Group – E rats were given Glibenclamide 1.5 mg/kg/day for 10 days

Figure – I : Bar diagram showing fasting blood glucose level in group C,D and E rats on day 1 and day 15.

Table III: Blood glucose lowering effect of cinnamon (*Cinnamomum cassiae*) on streptozotocin induced diabetic rats.

Group	FBG (mmol/L) on day 1 (Mean± SD)	FBG (mmol/L) on day 1 (Mean± SD)	p - value
C (n=6)	15.00± 3.33	16.00± 3.49	<0.001 ^s
D (n=6)	15.10± 3.19	8.00± 1.96	

Group – C = Standard normal diet was given for 10 days

Group – D = Aqueous extract of cinnamon 200 mg/kg/day was given for 10 days

Results were obtained through unpaired student’s “t” test

Table – III shows cinnamon significantly reduced blood glucose level of streptozotocin induced diabetic rats(P – value < 0.001; which is significant).

Table IV : Comparison of blood glucose lowering effect of cinnamon(Cinnamomum cassiae) and Glibenclamide on streptozotocin induced diabetic rats.

Group	FBG (mmol/L) on day 1 (Mean± SD)	FBG (mmol/L) on day 1 (Mean± SD)	p - value
D (n=6)	15.10± 3.19	8.00± 1.96	>0.10 ^{ns}
E (n=6)	14.80± 3.32	7.10± 0.55	

Group – D = Aqueous extract of cinnamon 200mg/kg/day was given for 10 days

Group – E = Glibenclamide 1.5 mg/kg/day was given for 10 days

Results were obtained through unpaired student's “ t” test

Table IV shows there is no statistically significant difference between cinnamon and Glibenclamide on blood glucose lowering effect in streptozotocin induced diabetic rats(P – value >0.10; which is not significant).

IV. Discussion

This was an experimental study, conducted in the department of pharmacology, Dhaka Medical College in between July, 2015 to June, 2016. The present study was carried out to evaluate the anti diabetic effect of cinnamon (*Cinnamomum cassiaie*) on experimentally induced diabetic rats. The blood glucose lowering effect of aqueous extract of cinnamon (*Cinnamomum cassiaie*) was tested in non diabetic and experimentally induced diabetic rats. The aqueous extract of cinnamon (*Cinnamomum cassiaie*) was given for 14 days in non diabetic rats and for 10 days in streptozotocin induced diabetic rats. The glucose lowering effect of cinnamon was compared with a standard oral anti diabetic drug, Glibenclamide. This was in accordance with Kim et al. [4] where they also gave cinnamon 14 days in non diabetic rats and 10 days in diabetic rats.

In the present study, diabetes was induced by streptozotocin. The dose and route of streptozotocin was in similarity with Omonkhua et al. [9]. The blood glucose level in animals were measured 72 hrs after administration of streptozotocin which was done according to the experiment of Akbarzadeh et al. [10].

There was no statistically significant difference in blood glucose level of non diabetic rats treated with aqueous extract of cinnamon as compared with normal control (p value > 0.10, which is not significant). This findings are in consistent with Kannappan et al. [11].

On day 4 of experiment -2, there was marked increase of blood glucose level by inj. Streptozotocin with no statistically significant difference in each group; which was also in similarity with Juarez et al. [12]. where they also found that streptozotocin almost equally raises blood glucose level in all rats.

Aqueous extract of cinnamon (*Cinnamomum cassiaie*) significantly reduces blood glucose level in streptozotocin induced diabetic rats (p value < 0.001,which is significant). This study is in similarity with Khalse et al. [13] & Khan et al. [14]. Thus this study hypothesis ‘Aqueous extract of cinnamon(*Cinnamomum cassiaie*) has got anti diabetic effect in streptozotocin induced diabetic rats’ was established.

The possible mechanism of glucose lowering action of cinnamon extract may be by potentiating the effect of insulin in serum or by increasing either the pancreatic secretion of insulin from the existing beta cells or its release from the bound from. Anderson et al. [15]. also found same anti diabetic action of cinnamon.

In this study, cinnamon had got no superiority over Glibenclamide in respect of blood glucose lowering effect on streptozotocin induced diabetic rats (p value > 0.10, which is not significant). This findings was not in similarity with Longe et al. [16]. where they found cinnamon has got more blood glucose lowering effect than Glibenclamide. Larger sample size and longer duration of their study may explain this discrepancy.

V. Conclusion

The study was conducted to find out anti diabetic effect of cinnamon on experimentally induced diabetic rats. The present study found that cinnamon (*Cinnamomum cassiaie*) significantly lowers blood glucose level in experimentally induced diabetic rats. So cinnamon can be used as alternative anti-diabetic medicine for its easy availability, cost effectiveness and as well as lack of significant side effects.

Recommendation

Further human study with large sample size and long duration is needed to find out the anti-diabetic effect of cinnamon (*Cinnamomum cassiaie*) on diabetic patients.

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