

Anti Diabetic Effects of Cinnamon Extract in Albino Rats with Effects on the Serum Insulin Levels

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ABSTRACT

Objective: To determine the changes in the serum insulin levels in alloxan induced diabetic albino rats in comparison with oral hypoglycemic drugs.

Study Design: An experimental study.

Place and Duration of Study: This study was conducted at Al Tibri Medical College Karachi during December 2012 to December 2013.

Materials and Methods: The present study was conducted on 60 Albino rats which were group from A to F consisting of 10 rats in each group. These groups were further divided into two sub groups which were treated with low dose and high dose of the cinnamon and oral hypoglycemic drugs.

Results: The results showed that there is significant reduction in serum insulin level in the alloxan treated group animals which was improved in group C animals treated with low dose of cinnamon extract in alloxan induced diabetic rats. Also animals in group D and group E treated with tolbutamide and acarbose respectively showed higher increase in serum insulin level as compared with cinnamon extract treated groups, however when cinnamon extract was used in combination with tolbutamide or acarbose it showed synergistic effects.

Conclusion: Tolbutamide and Acarbose treated groups showed better anti diabetic effect by increasing the serum insulin level in comparison with cinnamon extract treated groups when used individually. This effect was enhanced when cinnamon extract was used in combination with either tolbutamide or acarbose.

Key Words: Diabetes, Alloxan, Serum insulin

INTRODUCTION

Diabetes mellitus is one the leading cause of the death resulting in about 2.9 million of deaths every year and is considered as third largest cause of death in industrialized countries. The prevalence of diabetes mellitus is expected to rise in recent years across the world^{1,2,3}. The prevalence rate of this disease across the world is increasing remarkably^{4,5}. In Pakistan, males are usually affected more with this disease due to impaired glucose tolerance. Also the people living in urban areas suffered with this disease more as compared to people living in rural area due to change in their life style^{6,7}. Diabetes mellitus can be surgically or chemically induced in various species of animal. Chemical induction of the diabetes can be gained by administration of either alloxan or streptozotocin^{8,9}. Research have been conducted in the last few decades on plants mentioned in ancient literature have anti-diabetic property¹⁰.

As far as the management of this disease is concerned different other parameters should be carried out like diet, weight control, regular exercise, nature of physical activity, use of hypoglycemic drugs as prescribed by the physicians and continuous monitoring the status of this disease¹¹⁻¹⁴. The present study is designed to determine the effects cinnamon extract in comparison

with two hypoglycemic drugs tolbutamide and acarbose (glucobay) in alloxan induced diabetic rats.

MATERIALS AND METHODS

The present experimental study was carried out in the Department of Physiology Al-Tibri Medical College and Hospital, Karachi from December 2012 to December 2013. In this study 60 Albino rats of both sexes were included which were grouped from A to F. Each group of 10 rats was further divided into two sub-groups containing 5 rats in each subgroup.

- Animals in Group A1 were treated with normal saline only where as Group A2 as Diabetic Control were treated with Alloxan.
- Animals in Group B1 were treated with low dose cinnamon extract where as Group B2 were treated with high dose cinnamon extract.
- Animals in Group C1 were treated with low dose tolbutamide where as Group C2 were treated with high dose tolbutamide.
- Animals in Group D1 were treated with low dose acarbose where as Group D2 were treated with high dose acarbose.
- Animals in Group E1 were treated with combination of low dose cinnamon extract plus low dose tolbutamide where as Group E2 were

treated with low dose cinnamon extract plus low dose acarbose.

- Animals in Group F1 were treated with combination of high dose cinnamon extract plus high dose tolbutamide where as Group F2 were treated with high dose cinnamon extract plus high dose acarbose.

All the data obtained after experimental work was analyzed statistically by SPSS version 21, Chi-square test and student T-test was used to compare the findings between the affected and control group. Statistically P value < 0.05 was considered significant.

RESULTS

The serum insulin level of cinnamon extract were observed and compared with the control animals and anti-diabetic drugs groups.

1. Comparison of Serum Insulin Level ($\mu\text{U/ml}$)

Within Group A: Mean serum insulin level of group A1 was 56 where as in group A2 it was 28 as shown in Table 1. Group A2 showed significant decrease in serum insulin level after alloxan induction.

Table No.1: Mean serum insulin level of Group A1 and A2

Serum Insulin ($\mu\text{U/mL}$)						
Group	Initial	1 ST DAY	07 TH DAY	14 TH DAY	21 ST DAY	30 TH DAY
Normal Saline	57.38 ± 1.43	56.84 ± 1.49	57.72 ± 2.16	57.93 ± 1.40	56.17 ± 2.05	56.88 ± 2.30
Alloxan	54 ± 2.34	19 ± 3.12	20 ± 2.12	22 ± 2.45	26 ± 3.12	28 ± 2.24

Table No.2: Mean serum insulin level of Group B1 and B2

Serum Insulin ($\mu\text{U/mL}$)						
Group	Initial	1 ST DAY	07 TH DAY	14 TH DAY	21 ST DAY	30 TH DAY
Cinnamon extract 200mg/kg	56 \pm 2.24	28 \pm 3.14	32 \pm 2.45	35 \pm 2.65	40 \pm 3.45	42 \pm 3.15
Cinnamon extract 600mg/kg	52 \pm 2.12	25 \pm 3.23	30 \pm 2.15	34 \pm 2.11	38 \pm 3.12	40 \pm 4.12

Table No.3: Mean serum insulin level of Group C1 and C2

Serum Insulin ($\mu\text{U/mL}$)						
Low Dose	Initial	1 ST DAY	07 TH DAY	14 TH DAY	21 ST DAY	30 TH DAY
Tolbutamide 20 mg/kg	50	28	35	40	42	45
Tolbutamide 40 mg/kg	52	24	38	42	45	48

2. Comparison of Serum Insulin Level ($\mu\text{U/ml}$)

Within Group B: Mean serum insulin level of group B1 was 42 where as in group B2 it was 40 as shown in Table 2. Group B1 showed significant rise in serum insulin level as compare to Group B2.

3. Comparison of Serum Insulin Level ($\mu\text{U/ml}$)

Within Group C: Mean serum insulin level of group C1 was 45 where as in group C2 it was 48 as shown in

Table 3. Group C2 showed significant rise in serum insulin level as compare to Group C1.

4. Comparison of Serum Insulin Level ($\mu\text{U/ml}$)

Within Group D: Mean serum insulin level of group D1 was 40 where as in group D2 it was 42 as shown in Table 4. Group D2 showed significant rise in serum insulin level as compare to Group D1.

Table No.4: Mean serum insulin level of Group D1 and D2

Serum Insulin ($\mu\text{U/mL}$)						
Low Dose	Initial	1 ST DAY	07 TH DAY	14 TH DAY	21 ST DAY	30 TH DAY
Acarbose 30mg/kg	50 \pm .56	30 \pm 0.31	35 \pm 1.86	38 \pm 1.35	40 \pm 0.89	43 \pm .01
Acarbose 60mg/kg	50 \pm 0.12	32 \pm 1.31	35 \pm 2.76	39 \pm 2.18	42 \pm 0.34	45 \pm 0.61

Table No.5: Mean serum insulin level of Group E1 and E2

Serum Insulin ($\mu\text{U/mL}$)						
Group	Initial	1 ST DAY	07 TH DAY	14 TH DAY	21 ST DAY	30 TH DAY
Cinnamon ext 200 mg/kg	52 \pm 2.12	30 \pm 1.31	38 \pm 2.76	42 \pm 2.18	45 \pm 2.34	47 \pm 2.61
Tolbutamide 20mg/kg						
Cinnamon ext 200 mg/kg	47 \pm 1.33	33 \pm 2.21	37 \pm 2.24	40 \pm 2.11	45 \pm 2.68	46 \pm 2.65
Acarbose 30mg/kg						

Table No.6: Mean serum insulin level of Group F1 and F2

Serum Insulin ($\mu\text{U/mL}$)						
High Dose	Initial	1 ST DAY	07 TH DAY	14 TH DAY	21 ST DAY	30 TH DAY
Cinnamon ext 600 mg/kg	52 \pm 2.56	30 \pm 2.33	40 \pm 2.65	43 \pm 2.87	45 \pm 2.67	48 \pm 2.64
Tolbutamide 40mg/kg						
Cinnamon ext 600 mg/kg	50 \pm 2.56	34 \pm 2.34	38 \pm 2.89	42 \pm 2.56	45 \pm 2.35	47 \pm 2.33
Acarbose 60 mg /Kg						

5. Comparison of Serum Insulin Level ($\mu\text{U/ml}$)

Within Group E: Mean serum insulin level of group E1 was 47 where as I group E2 it was 48 as shown in Table 5. Group E1 showed significant rise in serum insulin level as compare to Group E2.

6. Comparison of Serum Insulin Level ($\mu\text{U/ml}$)

Within Group F: Mean serum insulin level of group F1 was 48 where as in group F2 it was 46 as shown in Table 6. Group F1 showed significant rise in serum insulin level as compare to Group F2.

DISCUSSION

Many herbal and medicinal plant materials have been used traditionally in folk medicine in the management of diabetes throughout the world. Main goal of these herbs is to lower the blood glucose level either decreasing the peripheral insulin resistance or increasing the serum insulin level. Some of these herbs are also used as medicine in clinical trials same to that of drugs used in western countries^{15,16}.

The mode of action of hypoglycemic activity of cinnamon extract may be due to the increase in serum insulin level¹⁷. In the present study alloxan was used to induce the diabetes in albino rats and when animals with low dose of cinnamon extract were compared with other groups of animals, there was an increase in serum insulin level. Hypoglycemic drugs (i-e tolbutamide and Acarbose) treated group show better anti diabetic effect in comparison with cinnamon extract treated group p value<0.011 and p value<0.016 respectively. When cinnamon was used in combination with either tolbutamide or acarbose it showed synergetic effects. The same finding was also noted by Mahmood et al.¹⁸. Also when animals in cinnamon extract treated group were compared with other groups with high dose 600 mg/kg there was an increase in serum insulin level. The present study also agreed with the study of Qin et al.¹⁹. Therefore, the present study has identified that cinnamon extract has less anti-diabetic effect as compared with hypoglycemic drugs but it may be used as adjuvant therapy in combination with anti-diabetic agents.

CONCLUSION

Tolbutamide and Acarbose treated groups showed better anti diabetic effect by increasing the serum insulin level in comparison with cinnamon extract treated groups when used individually. This effect was enhanced when cinnamon extract was used in combination with either tolbutamide or acarbose.

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