Original Article

Anti-Oxident Effects of Cinnamon Extract in Alloxan-Induced Diabetic Rats

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ABSTRACT

Objective: To evaluate the antioxidant effects of cinnamon extract in alloxan induced diabetic rats.
Study Design: Experimental Study
Place and Duration of Study: This study was conducted at the Al-Tibri Medical College Isra University Karachi Campus during the period of December, 2012 to June, 2013.
Materials and Methods: Experimental study was designed with total 32 numbers of male rats, and the animals were randomized selected from the animal house after taken an ethical approval from the concerned authority. Animals were divided into four groups on the therapeutic basis. Diabetes was induced in rats by using alloxan and the antioxidant effects were evaluated through antioxidant enzymes. The data was analyzed through SPSS by applying One-way ANOVA to compare the mean difference between the groups. The level of significance was considered P=<0.05.
Results: Antioxidant level was maintained among the diabetic rats after utilization of cinnamon extract.
Conclusion: The result indicates that in diabetic conditions, oxidative stress is induced that causes peroxidative damage to membrane lipids. Cinnamon extract helps in restoration of antioxidant enzyme activity and their transcription.
Key Words: alloxan-induced diabetes, oxidative stress, antioxidant enzymes, cinnamon

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INTRODUCTION

Diabetes is one of the comorbidities among the infected peoples. The prevalence of the diabetes is still unknown, and different metaanalysis established the prevalence ratio of 10.3% and Mean age was reported around 49.5.[1] Metabolic disorders induced multiple underlying stress that can alter the different organic functional and chemical compositions, results in establishing an oxidative stress.[2] The cellular reduction-oxidation difference leads effects the oxidative levels that can alter the cell signaling process of β-cell dysfunction and insulin resistance. The numerous factors create an influence, that can cause the various functional defects especially in reducing the solubility, storage insufficiency, and this impair systematic regulation can affect the pharmacokinetics and their availability. [3] Short-lived reactive species (free radicals) that contains the one or more pair of electrons that can damage the cell by an oxidation. Diabetes provoke the oxidative stress and results in cell damage.[4] Reactive oxygen species stimulated by non-enzymatic glycoprotein and glucose oxidation and the activity of glucose transportation leads to insulin resistance.[5] Lipid peroxidation increased with the alteration in oxidative level of the body, and influence by target the defensive function against enzymatic and non-enzymatic antioxidants. [6] In diabetes the oxidative stress mainly changes the biochemical composition of cellular integrity and simultaneously become dangerous for insulin producing cells of pancreas. Free radicals induce alteration in cell signaling pathway inside the cell, like extra cellular signal regulated kinase pathway.[7] The purpose of the study to assess the effects of cinnamon extract in restoration of antioxidant levels, that are essential to maintain the integrity of β cells of pancreas in diabetic rats, as now in our community the diabetes is one of the common metabolic disorder that needs importance from heath care providers in controlling this health issue.

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MATERIALS AND METHODS

The experimental study was designed at Al-Tibri Medical College, Isra university karachi campus from

December 2012 to June 2013 After taken an ethical approval from the concerned authority, and total 32 numbers of male albino rats were randomized selected from the animal house with weight of 150 to 250mg. All rats were divided into four groups on the basis of therapeutic design. The cinnamon barks were purchased from the market, then these barks were washed with distilled water, and then dry to form the powder from these barks. 8 grams of powder was dissolved in 100ml of distilled water and then incubate at 60°C for an hour. This extract was administered with gavage tube daily for 4 weeks once daily. Group A (control Group) received normal saline, Group B (normal saline +cinnamon extract), Group C (diabetic group) induced by alloxane, and Group D (alloxane + cinnamon extract). The antioxidant enzyme was evaluated by preparing the lysate followed by centrifuging the blood sample. We observe the following antioxidant enzymes like catalase, superoxide dismutase (SOD) and glutathione reductase (GR). Data was collected from the alloxane based group to establish the confirmation of the diabetic status. After receiving the cinnamon extract for 4 weeks the blood sample were collected to compare the level of antioxidant enzymes. The data was analyzed through SPSS, the Mean value of each enzyme were compare through One-way ANOVA followed by post hoc Tukey's test, to ananlyze the significance difference between the groups.

RESULTS

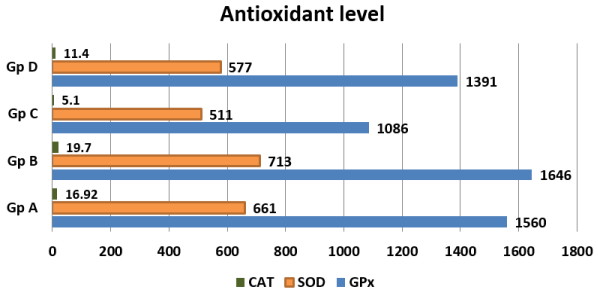

Figure No.1: Mean level of antioxidant enzyme among different therapeutic groups. CAT: catalase enzyme, SOD: superoxide dismutase, GPx: Glutathione peroxidase enzyme

Table No.1: Level of significance among the different therapeutic groups

Groups	Glutathione peroxidase	superoxide dismutase	catalase
Group C vs A	≤0.001	≤0.001	≤0.001
Group C vs B	≤0.001	≤0.001	≤0.001
Group C vs D	≤0.001	≤0.001	≤0.001

One-way ANOVA followed the post hoc Tukey's test applied P=<0.05

Antioxidant level was maintained among the diabetic rats after utilization of cinnamon extract.

Figure I shows the Mean values of antioxidant enzymes among different therapeutic groups.

Table 1 shows the level of significance among the different therapeutic groups.

DISCUSSION

Cinnamon extract used commonly around the world especially as herbal component especially in Asian countries for different therapeutic purpose. It mainly composed of hypoglycemic agent and simultaneously reduces the insulin sensitivity. Similarly, in the present study, cinnamon shows efficient role in reducing hyperglycemia and control the insulin sensitivity. In accordance with the study results, there was no significant role of cinnamon extract with the dose of 8gms for 8 weeks, and there was no reduction in glucose levels. Now in the present study the effects of cinnamon extract show remarkable effects in lowering the blood glucose levels.[9] The results of the study that was conducted to analyze the effects of cinnamon extract to improve the oxidative stress induced by the acrylamide in animal model. The extract shows significant restoration of antioxidant levels after inducing acrylamide toxicity as in the resent study, the positive effects was shown by the similar extract.[10] This herbal extract recovers lipid profile by inhibiting the ß-hydroxy-ß-methylglutaryl-coenzyme-A (HMG Co-A) reductase and evidence the restoration of oxidative stress. As per results of the present study, the same herbal product minimizes the injurious effects of free radicals resulting due to underlying diabetes.[11] One of the metaanalysis or a systemic review regarding usage of cinnamon extract as a supplement in reducing the lipid profile, as per results of that study shows the significant reduction in lipids levels and also covers the lipid peroxidation, that may leads to diminish the oxidative stress and maintain the bioavailability of antioxidant enzymes to establish the cell signaling pathway and restore the physiological and biochemical activity of enzymes.[12-13] In accordance with the study results the utilization of cinnamon oil as a potent protector against oxidative stress in mice, and they conclude the effective role of oil in reducing the oxidative stress like in the present study.[14] According to the study that was designed to induced acetaminophen induced liver toxicity that produces apoptosis and oxidative stress. They conclude the hepatoprotective role of cinnamon oil in restoring the liver injury and regulate the oxidative pressure along with boost up the antioxidant enzyme activity and enhance the anti-inflammatory response, as shown in present study the regulation of antioxidant enzyme activity produced by cinnamon extract application in diabetes rats.[15] In one

of the study the combination therapy was introduced to the type 2 diabetic rats for the purpose to maintain the glycemic control and lipid metabolic disturbance along with reduction in body weight. They induced the combination of ginger, cinnamon extract and turmeric for the hyperglycemic control in animal model. The results reveled the amazing facts by using this regime, control the complications results due to diabetes by overcome the oxidative stress, inflammatory conditions and manage the lipid serum levels.[16] All these facts combine establish the positive evidence regarding the usage of cinnamon extract or oil as an herbal product in the treatment of oxidative stress, and maintain the metabolic imbalance of the body.

CONCLUSION

The study conclude the antioxidant role of cinnamon extract when apply in diabetic rats. The level of antioxidant enzymes shows remarkable balancing in cinnamon feed groups by reducing the production of reactive oxygen species and restore the oxidative stress along with maintain the cellular integrity.

Author's Contribution:

Concept & Design of Study:	Muhammad Sajid Khan
Drafting:	Raheela Adil, Sabahat Gul
Data Analysis:	Farheen Hameed, Mohammad Sair, Muhammad Adnan Sadiq
Revisiting Critically:	Muhammad Sajid Khan, Raheela Adil, Sabahat Gul
Final Approval of version:	Muhammad Sajid Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Fadini GP, Morieri ML, Longato E, Avogaro A. Prevalence and impact of diabetes among people infected with SARS-CoV-2. J Endocrinological Investigation 2020;43(6):867-9.
2. Găman MA, Epîngeac ME, Diaconu CC, Găman AM. Evaluation of oxidative stress levels in obesity and diabetes by the free oxygen radical test and free oxygen radical defence assays and correlations with anthropometric and laboratory parameters. World J Diabetes 2020;11(5):193.
3. Duvvuri LS, Katiyar S, Kumar A, Khan W. Delivery aspects of antioxidants in diabetes management. Expert Opin Drug Deliv 2015;12(5): 827–844.
4. Bukhari SA, Naqvi SA, Nagra SA, Anjum F, Javed S, Farooq M. Assessing of oxidative stress related parameters in diabetes mellitus type 2: cause excessive damaging to DNA and enhanced homocysteine in diabetic patients. Pak J Pharm Sci 2015;28(2):483–491.
5. Chandra K, Singh P, Dwivedi S, Jain SK. Diabetes Mellitus and Oxidative Stress: A Co-relative and Therapeutic Approach. J Clin Diagnostic Res 2019:1;13(5).
6. Yan LJ. Redox imbalance stress in diabetes mellitus: Role of the polyol pathway. Animal Models Experimental Med 2018;1(1):7-13.
7. Savini I, Catani M, Evangelista D, Gasperi V, Avigliano L. Obesity-associated oxidative stress: Strategies finalized to improve redox state. Int J Mol Sci 2013;14:10497-538.
8. Vijayakumar K, Prasanna B, Rengarajan RL, Rathinam A, Velayuthaprabhu S, Vijaya Anand A. Anti-diabetic and hypolipidemic effects of Cinnamon cassia bark extracts: an in vitro, in vivo, and in silico approach. Archives Physiol Biochemistry 2020;25:1-1. `
9. Davari M, Hashemi R, Mirmiran P, Hedayati M, Sahranavard S, Bahreini S, et al. Effects of cinnamon supplementation on expression of systemic inflammation factors, NF-kB and Sirtuin-1 (SIRT1) in type 2 diabetes: a randomized, double blind, and controlled clinical trial. Nutrition J 2020;19(1):1-8.
10. Haidari F, Mohammadshahi M, Abiri B, Zarei M, Fathi M. Cinnamon extract supplementation improves inflammation and oxidative stress induced by acrylamide: An experimental animal study. Avicenna J Phytomed 2020;10(3):243.
11. Shahrestan F, Jafari P, Gharebaghi A, Khani Farahani I, Shahrestan E. Effect of Bioflora and Cinnamon Extract Consumption on Dyslipidemia and Cardiovascular Disease in a Diabetic Rat Model. J Arak Univ Med Sci 2020; 23(2): 198-209.
12. Jamali N, Kazemi A, Saffari-Chaleshtori J, Samare-Najaf M, Mohammadi V, Clark CC. The effect of cinnamon supplementation on lipid profiles in patients with type 2 diabetes: A systematic review and meta-analysis of clinical trials. Complementary Therapies in Med 2020; 29:102571.
13. Elshopakey GE, Elazab ST. Cinnamon Aqueous Extract Attenuates Diclofenac Sodium and Oxytetracycline Mediated Hepato-Renal Toxicity and Modulates Oxidative Stress, Cell Apoptosis, and Inflammation in Male Albino Rats. Veterinary Sci 2021;8(1):9.

14. Salman AS, Al-Shaikh TM, Hamza ZK, El-Nekeety AA, Bawazir SS, Hassan NS, et al. Matlodextrin-cinnamon essential oil nanoformulation as a potent protective against titanium nanoparticles-induced oxidative stress, genotoxicity, and reproductive disturbances in male mice. Environmental Science and Pollution Res 2021;20:1-7.
15. Hussain S, Ashafaq M, Alshahrani S, Siddiqui R, Ahmed RA, Khuwaja G, et al. Cinnamon oil against acetaminophen-induced acute liver toxicity by attenuating inflammation, oxidative stress and apoptosis. Toxicology Reports 2020,1(7): 1296-304.
16. Moosavi L, Mazloom Z, Mokhtari M, Mohammadi Sartang M, Mahmoodi M. Comparison of the Effects of Combination of Turmeric, Ginger and Cinnamon Hydroalcoholic Extracts with Metformin on Body Weight, Glycemic Control, Inflammation, Oxidative Stress and Pancreatic Histopatalogical Changes in Diabetic Rat. Int J Nutr Sci 2020;5(2):61-8.