Original Article

The Conjoint Effects of Cinnamon and Metformin on Anthropometric and Glycemic indices in Drug Naïve type II Diabetic Patients

Yameen Bocha[1], Kauser Ismail[1], Muhammad Owais Ismail[1], Suresh Kumar[2], Akhtar Ali[1] and Faisal Raees[2]

ABSTRACT

Objective: To evaluate the combined effects of cinnamon and metformin on anthropometric and glycemic indices of type II diabetic patients.

Study Design: randomized control clinical trial study

Place and Duration of Study: This study was conducted at the Diabetes clinic at Lyari General Hospital, in Karachi, Pakistan from December 2021 to May 2022

Materials and Methods: In total, 40 newly diagnosed type II diabetic patients were enrolled using the sequential sample technique from December 2021 to May 2022 (12 weeks for each patient) in this study through randomization. The enrolled patients were equally divided into two groups. Group 1 was provided standard treatment metformin 500mg BID while group 2 received metformin 500 mg BID with cinnamon capsule 250 mg BID daily for a period of 12 weeks. Anthropometric measurements like weight were measured in kg and the height was measured in feet and inches. The BMI was calculated through height and weight. Fasting blood sugar levels and hemoglobin A1c were analyzed at the beginning and after 12 weeks of study. The data was analyzed using SPSS software version 20. Mean and standard deviation were calculated for Numerical variables. Frequencies and percentages were calculated for Categorical Variables. Independent t-test was used for intergroup analysis while pre and post analysis was measured by paired t-test. P-value less than 0.05 were considered significant.

Results: Both treatment groups were found to be equally effective in lowering the BMI while metformin + cinnamon group showed superiority in dropping down FBS and HbA1c levels over metformin alone group.

Conclusion: Cinnamon can be used as an effective adjunctive with standard anti-diabetic drugs like metformin to increase the treatment efficacy in diabetic patients.

Key Words: Cinnamon, Metformin, Glycemic indices, type II Diabetes, Clinical Trial

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INTRODUCTION

Diabetes mellitus(DM) is a serious health concern that has alarmingly increased in incidence by over 90% over the previous ten years, greatly increasing the worldwide burden of health related diseases[(1)]. Type 2, formerly known as non-insulin dependent diabetes mellitus, gradually progresses to a condition of chronic hyperglycemia, which causes a wide range of complications[(2)]. Type 2 DM has affected more than 536.6 million (10.5%) people worldwide in 2021, as published in International Diabetic Federation (IDF) Atlas, which reported that 61.4 million (9.2%) people in European region and 90.2 million (10%)people in Asia are suffering from this indolently progressive disease. In Pakistan, a study published in 2022 reported that 33 percent population is affected from Type 2 DM. These facts and figures reflects that type 2 DM is a major economic stress on health sector across the world [(3)]

Though the underlying cellular mechanism causing type 2 diabetes is still not fully known, both genetics and epigenetics account for the majority of cases. The eventual etiology is defect in secretory mechanisms of insulin, worse by environmental causes like obesity, improper dietary habits, and deskbound lifestyle leading to insulin resistance [(4)].

Particularly weight that splits people into underweight, healthy weight, overweight, and obese according to

[1.] Department of Pharmacology, Ziauddin medical College, Ziauddin University, Karachi.
[2.] Department of Medicine, Lyari General Hospital, SMBB Medical College Karachi.

Correspondence: Dr. Muhammad Yameen Bocha, Ziauddin University, Karachi.
Contact No: 03361221783
Email: dryamin.bocha@gmail.com

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their anthropometric measurements of height and weight (BMI), is frequently employed in population-based studies as a risk factor of diabetes and other metabolic diseases [5]. Therefore, it would not be incorrect to hypothesize that a rise in BMI would intensify the risk of developing diabetes in population with certain genetic dispositions.

Metformin, a biguanide, is recommended as first line or preferred medication for type 2 diabetes[6]. This appears to be caused in large part by metformin's capacity to cause weight loss in both diabetics and non-diabetics [7]. Its euglycemic properties appear to be a result of various mechanisms, including increased insulin uptake in peripheral tissues and decreased hepatic gluconeogenesis[8]. However long term side effects associated with it like vitamin B deficiency, loss of response overtime etc. compel the researchers to look for other options for optimistic balance of hyperglycemia.

In this regard concept of integrated medicine has opened a new horizon to combat this chronic condition in which herbal agents are being used with contemporary medicine. Cinnamon, the inside bark of cinnamon tree, a common culinary agent has been in use for various medical conditions since several decades, [9]. Multiple researches have documented the anti-hyperglycemic characteristics of cinnamon [10] as evident by a drop in hemoglobin A1C [11]. Furthermore, various clinical trials back up the findings of the spice's involvement in weight loss as well, but strong evidences are lacking [12]. These inconsistent findings, however, call for more studies on larger scale. Further It's crucial to keep in mind that there is little research demonstrating the combine actions of cinnamon and metformin on type 2 diabetes on anthropometric and glycemic indices. Therefore, this study is meant to investigate if metformin and cinnamon interact to help newly diagnosed type 2 diabetics patients in controlling their weight and glycemic levels.

MATERIALS AND METHODS

2.1 Clinical Trial Design and Setting

It was an open label randomized control trial conducted at the Diabetes clinic at Lyari General Hospital, in Karachi, Pakistan.

Sample Size: The sample size was calculated by Sealed Envelope calculator version 201:

- Significance level (alpha) 1%
- 99% confidence interval.
- Power (1-beta) 90

The minimal required sample size was calculated to be 36 (13). However, a total of 40 patients were enrolled using the sequential sample technique from December 2021 to May 2022 (12 weeks for each patient). Patients were enrolled in the study through randomization using computer generated numbers

2.2 Participant Criteria

Following patients were recruited in this study

1. Newly diagnosed cases of Type 2 DM.
2. HbA1C of 7% - 8.4%.
3. Hypersensitivity to metformin or cinnamon.
4. Patient who are sound minded.

Patients who did not match the aforementioned requirements or those who were receiving diabetes treatment of any kind were excluded from the study.

2.3 Study Design After thoroughly explaining the trial 's methodology and getting the participants' signed informed consent, a patient pro forma with relevant information, pertinent health issues and allergies was given to each patient. The newly diagnosed diabetic patients were divided into two groups with 20 patients in each group. Group 1 was given standard treatment metformin 500mg BD only while group 2 received metformin 500 mg BD with cinnamon capsule 250 mg BD daily for a period of 12 weeks. For consistency, the researcher has purchased all of the Cinnamon capsules from the same supplier.

Anthropometric measurements like weight were measured in kg and the height was measured using a standard calibrated scale in feet and inches.

The Body Mass Index was then calculated using the formula:

Metric units: BMI = weight (kg) ÷ height 2 (m2).

Fasting blood sugar levels (via Glucometer) and hemoglobin A1c (analyzed by ROCHE COBAS c 311 via Immunoassay) were analyzed at the Lyari General Hospital Laboratory in Karachi at the beginning and the conclusion of each patient's 12-week program.

2.4 Statistical Analysis: The data was analyzed using SPSS software version 20. Mean and standard deviation were calculated for Numerical variables. Frequencies and percentages were calculated for Categorical Variables. Independent t-test was used for intergroup analysis while pre and post analysis was measured by paired t-test. P-value < 0.05 was considered significant.

RESULTS

Table No.1: Basic Demographic and Anthropometric characteristics of the enrolled patients

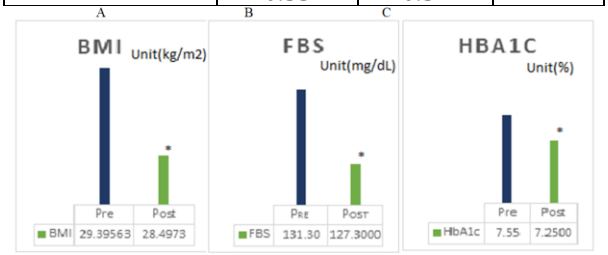
Demographic Characteristics	Mean
Age	50.15
Gender	Male 17.5(87.5%) Female 2.5(12.5%)
BMI	28.89

Table No.2: Pre-Treatment intergroup Comparison of Anthropometric and Glycemic Indices of Patients Receiving Metformin and Metformin + Cinnamon

Characteristic	M	M+C	p-value
Weight (kg)	87.7 ± 8.81	85.7 ± 8.81	1.000
BMI	29.39 ± 2.33	28.74 ± 2.34	0.359
FBS(mg/dL)	131.30 ± 9.88	127.75 ± 7.22	0.208
HbA1C(%)	7.55 ± 0.55	7.05 ± 0.57	0.22

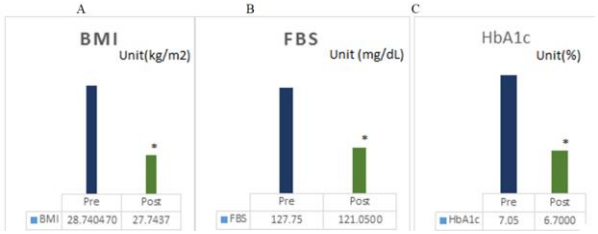
Table No. 3: Post Treatment Intergroup Comparison of Anthropometric and Glycemic Indices of Patients Receiving Metformin and Metformin + Cinnamon

Characteristic	M	M+C	p-value
Weight (kg)	85.05 ± 9.21	82.75 ± 9.15	0.289
BMI	28.49 ± 2.33	27.74 ± 2.34	0.176
FBS(mg/dL)	127.75 ± 9.88	121.05 ± 7.22	0.05
HbA1C(%)	7.25 ± 0.55	6.7 ± 0.57	0.001



*P value<0.05

Figure No.1: Pre and Post treatment intragroup comparison of Metformin group



*P value <0.05

Figure No.2: Pre and Post treatment intragroup comparison of Metformin + Cinnamon group

DISCUSSION

It is well known that Type II Diabetes Mellitus is currently one of the most common chronic diseases worldwide, posing serious problems to public health [14]. As emphasized earlier, the risk factors primarily consist of sedentary lifestyles and poor eating patterns leading to Obesity [15].Thus, obesity is one of the primary risk factors which is responsible for insulin resistance eventually, loss of insulin production, resulting in chronic hyperglycemic state and, if untreated, can lead to several microvascular as well as macrovascular glitches[16].

Our investigation reveals demographic features of male preponderance with mean age of 50 years in the study subjects **(table1)** which is supported by several studies done earlier.[17-19]

Our study also reflects most of the patients were obese as evident by mean BMI=28.89 **(table1**). As emphasized earlier, Obesity is one of the major modifiable risk factors for developing type 2 DM and other metabolic syndrome, as a consequence of engendering insulin resistance, loss of insulin response and production ensues resulting in chronic hyperglycemic state and, if untreated, can lead to several microvascular as well as macro-vascular glitches. Hence, FDA includes [20].

In line with this and keeping in view the weight tailoring potential of cinnamon, we have designed this trial to appraise and compare its combine effectiveness with metformin and we found that both groups significantly reduce weight loss after 12 weeks of treatment. Numerous researches support the idea that metformin causes weight loss[21, 22]. However there are conflicting findings for cinnamon related to its effects on weight [23]. Further, there is lack of researches which can show the combine impact of both agents on this anthropometric index of patients. Though our combination group of metformin and cinnamon did not show superiority over metformin alone group in decreasing the patient's body weight **(table3),** but the importance of this combination as potentially effective regime for weight loss particularly in diabetic patients cannot be negated and further studies on larger samples and larger doses will be required before reaching on any ultimate conclusion.

Due to its outstanding ability to decrease hyperglycemia, metformin is renown first line medication for type 2 diabetes mellitus[24,25]. However, alternative anti-diabetic medications can be taken in combination to improve glycemic indices in circumstances where metformin alone is unable to regulate blood sugar levels [26] and/or is frequently linked to serious gastrointestinal discomfort and Vitamin B12 deficiency [27] To overcome the adverse effects of the conventional anti-diabetic drugs, [28] with different herbal agents. One such herb is Cinnamon which is renowned household since decades. Numerous researches conducted on both people and animals point towards the anti-diabetic properties of cinnamon when administered alone. In this regard, after administering cinnamon to diabetic rats for 6 weeks, Shehata et al. documented that there was a reduction in blood glucose levels as well as an increase in antioxidant

capacity [29]. Also, in type II diabetics, a recent clinical research indicates a substantial reduction in fasting blood sugar and hemoglobin A1c levels after administration of cinnamon for 40 days of duration at the dose of 1,2 and 3 grams [30].

Our results showed that both metformin and cinnamon have significantly decreased blood glycemic indices over 12 weeks' duration. In this regard, we have found superior action of combination of metformin and cinnamon compared to metformin alone **(Table-3)**. Probable mechanisms of action this multifaceted herb maybe attributed to abundance of polyphenols which activate insulin receptor kinase, do auto phosphorylation of the insulin receptor, increase peripheral glucose uptake etc. [31]

Hence the combination of conventional and herbal treatments, such as metformin and cinnamon, is the focus of our investigation, which, to the best of our knowledge, is fairly novel. Since the sample size was limited, this experiment is vulnerable to bias. Therefore, in order to support the claim made in this study, we need further more expanded and longitudinal clinical trials on larger patients' numbers and comparative groups.

CONCLUSION

Our study suggests the superior anti-hyperglycemic but equal weight loss effects of combine Cinnamon and Metformin against Metformin alone in recently diagnosed type II diabetes patients. It is still initial, and more research on larger sample sizes must be conducted and compared with other standard drugs to showcase this combination as effective anti-diabetic regime.

Author's Contribution:

Concept & Design of Study:	Yameen Bocha
Drafting:	Kauser Ismail, Muhammad Owais Ismail
Data Analysis:	Suresh Kumar, Akhtar Ali, Faisal Raees
Revisiting Critically:	Yameen Bocha, Kauser Ismail
Final Approval of version:	Yameen Bocha

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

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