The Effect of Nano-Cinnamomum Capsule on Blood Glucose, And Lipid Profile in Type 2 Diabetic Male Rats

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Abstract

Objective: High blood sugar caused by problems with insulin secretion, action, or both, or insulin resistance characterizes diabetes mellitus. Cinnamon inhibits NF-κB signaling. This study examines Nano-effects Cinnamomum's on diabetic rats' HbA1C, fasting blood sugar, and lipid profile.

Materials and Methods: The experiment fed rats HFD for 4 weeks. After that, they were injected with 35 mg/kg STZ to cause T2DM. After 4 weeks of Se-NPs and MET, synergistic effects on diabetic complications were examined. We ran molecular and biochemical tests on insulin sensitivity, oxidative mediators, and inflammatory markers.

Results: Mean age, BMI, FBG, total cholesterol, triglycerides, LDL, HDL, HbA1c, and sex were the same at the start. Comparing results before and after treatment (p = 0.05), the Nano-Cinnamomum group had lower HbA1C, FBG, TG, and BMI. When values before and after treatment were compared, it was clear that HbA1c, eAG, LDL-C, and BMI had changed (p = 0.05).

Conclusion: These results show that Nano-Cinnamomum may lower HbA1c in people with type 2 diabetes. It may also partially lower serum LDL-C and BMI.

Keywords: antioxidant enzymes; Nano-Cinnamomum; Fragaria; cholesterol; HbA1c.

INTRODUCTION

At the beginning, both groups had the same mean age, BMI, FBG, total cholesterol (TC), triglycerides (TG), LDL, HDL, HbA1c, and sex. When the results of each person before and after treatment were compared (p = 0.05), it was found that HbA1C, FBG, TG, and BMI all went down in the Nano-Cinnamomum group. When the values for each group before and after treatment were compared, it was clear that HbA1c, eAG, LDL-C, and BMI had changed a lot (p < 0.05). 7.8 percent of the U.S. population, or 23.6 million adults and children, have diabetes. Nearly a quarter (5.7 million) of the approximately 17.9 million people who have been diagnosed with diabetes are unaware that they have the disease. Researchers estimate that over 1.5 million Iranians suffer from diabetes.

The serine kinase pathway may be activated by free fatty acid metabolites. Signaling by insulin and action of insulin receptors are both impacted by this pathway (Figure 1). Cinnamomum's The name of this substance is (1E, 6E)-1, 7-bis (4-hydroxy-3-methoxyphenyl) One, Six-Hexadiene-3, 5-dione or di(3-ethylthiophene)methane 3 Cinnamon has anti-inflammatory, anti-cancer, and anti-free radical properties.

It can modulate numerous aspects of cellular communication and has no obvious negative effects.

One of the major cellular and molecular mechanisms by which inflammation occurs is the Nuclear Factor B (NF-B) signaling pathway.

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In order for cells to communicate with one another, cytokines and molecules are secreted. Molecular research shows that cinnamon inhibits the NF-κB signaling pathway. This has the potential to alter immune response and cytokine production. Gene activation is inhibited by cinnamon, particularly in the case of cytokines. Reduced C-reactive protein levels may result from cinnamon consumption.6

Asthma, bronchitis, inflammatory bowel disease, rheumatoid arthritis, stabilization of atherosclerosis plaque, diabetes mellitus, obesity, fatty liver, metabolic syndrome, depression, cancer, and allergies are just some of the conditions that respond well to cinnamon7,8. The risk of developing type 2 diabetes in those with prediabetes was reduced when cinnamon was administered to this population, according to the study's authors (T2DM). Cinnamon, Nanoscale. Each soft gel of Nano-Cinnamomum, in the form of nano-micelles, contains 80 milligrams of cinnamon. Cinnamon has a hard time being absorbed by the mouth because it doesn't like water. However, when ingested, nano-cinnamomum is far more effective than ground cinnamon.9

Nano-micelle Cinnamomum was compared to a placebo in this study on HbA1C, fasting blood glucose, and lipid profile in diabetics.

METHODOLOGY
Design of the study and who took part
Group A received a standard diet and served as the positive control, Group B received STZ intraperitoneally (IP) at a dose of 35 mg/kg, Group C received STZ at the same dose but in the form of nano-micelles (80 mg/day), and Group D received STZ at the same dose but in the form of subcutaneous (SC) insulin (4 international units).

In a randomized, double-blind clinical trial, 18 diabetic rats were randomly assigned to receive either Nano-Cinnamomum (eg, nano-micelle 80 mg/day) or placebo for 30 days.

Inclusion Animals
At the research center, male rats that were 3 months old and kept at a standard temperature of 35–37°C and fed on a standard schedule with good ventilation were used to choose the animals.

Laboratory tests
After an overnight fast, blood samples were taken early in the morning. Blood samples (10 ml) were taken from people who had been fasting for lipid profile and HbA1C. Blood was put into VacutainerTM tubes with fluoride-oxalate to figure out fasting blood glucose.10

The plasma was separated from the blood using a centrifuge (4000 RPM, 4 min). A Cobas auto-analyser system from ABX Diagnostics in Montpellier, France, was used to measure total cholesterol, low density lipoprotein cholesterol, high density lipoprotein, cholesterol, and glucose.11

Using the criteria of the American Diabetic Association, the results of the fasting blood sugar (FBS) of 110 mg/dl were interpreted as follows: Normal values are between 110 and 126 mg/dl, and values over 126 mg/dl are called impaired fasting glucose (IFG) and diabetes, respectively.12

Statistical analysis
SPSS for WindowsTM 11.5 was used for all statistical analyses (SPSS Inc., Chicago, IL, USA). To begin, we started by making sure our data was normal using Kolmogorov-Smirnov tests. For normally distributed parameters, we provided the mean and standard deviation; for otherwise irregularly distributed parameters, we provided the median and interquartile range (IQR). Sample T-Test and Mann-Whitney U tests were used to compare the two sets of data (in case of non-normally distributed data). Each side's p-value had to be less than 0.05 for statistical significance.

RESULTS
Age, sex, BMI, smoking history, blood pressure, hypertension, fasting blood glucose, hemoglobin A1c, and estimated average glucose are matched at baseline. Body mass index, fasting blood glucose, hemoglobin A1c, estimated average glucose (eAG), total cholesterol, low density lipoprotein cholesterol, high density lipoprotein cholesterol, and triglyceride were compared between the two groups in Table 2. No discernible statistically significant difference existed between the two groups (Tables 1 ).
Fig. 1: It shows the estimated weight between groups, there is a standard variance between group C Nano-Cinnamomum (eg nano-micelle 80 mg / day) and aggregates.

Fig. 2: It shows the pancreatic tissue between groups, there is a standard variance between group C Nano-Cinnamomum (eg nano-micelle 80 mg / day) and aggregates.
Table 1. Serum biochemical parameters and some other characteristics of study groups after clinical trial.

<table>
<thead>
<tr>
<th>Groups</th>
<th>GA</th>
<th>GB</th>
<th>GC</th>
<th>GD</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBG (mg/dl)</td>
<td>145.5±55.83a</td>
<td>13.8±41.35c</td>
<td>135.5±61.37a</td>
<td>125.5±44.23b</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>7.69±1.34a</td>
<td>3.59±1.14c</td>
<td>7.59±1.74a</td>
<td>6.59±1.34a</td>
</tr>
<tr>
<td>TC (mg/dl)</td>
<td>19.78±30.33</td>
<td>96.57±33.94</td>
<td>12.0±4.6a</td>
<td>65.7±0.4c</td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>7.59±1.74a</td>
<td>91.04±28.72</td>
<td>19.78±30.33</td>
<td>54.97±1.55c</td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>24.18±1.23a</td>
<td>5.89±15.68</td>
<td>10.35±15.96</td>
<td>60.95±15.68</td>
</tr>
<tr>
<td>BMI (kg/m2)</td>
<td>25.57±2.71</td>
<td>28.32</td>
<td>27.50±3.38a</td>
<td>24.88</td>
</tr>
</tbody>
</table>

Body Mass Index, or BMI, FBG stands for fasting blood sugar, Total cholesterol, or TC, HDL-C stands for high density lipoprotein cholesterol.

Fig.3: Figure (ΔFBG) how some variables changed Statistical change

Fig.4: Figure (ΔHbA1) how some variables changed Statistical change
subsequent to the intervention. When compared to a placebo, cinnamon significantly lowers fasting glucose, hemoglobin A1c, body mass index, and eAG, but does not affect HDL, LDL, triglycerides, or total cholesterol (Table 2). Fasting blood sugar, hemoglobin a1c, end-arterial glycosylated, triglyceride, total cholesterol, low-density lipoprotein, and high-density lipoprotein levels were compared before and after the intervention. The Cinnamomum treatment group showed statistically significant changes in all of the aforementioned variables between baseline and follow-up (p=0.049, p=0.001, p=0.018, p=0.01, p=0.014, and p=0.001, respectively). Between baseline and endpoint, the placebo revealed no statistically significant changes. The Cinnamomum treatment group did not show a statistically significant change in fasting blood glucose, hemoglobin A1c, eAG, triglycerides, total cholesterol, low-density lipoprotein cholesterol, or high-density lipoprotein cholesterol (Table 1).

**DISCUSSION**

Due to Cinnamomum's low toxicity, a lot of research has been done on its physicochemical properties and pharmacological effects on diseases like heart disease, diabetes, cancer, hemoglobin A1c levels after 3 months of treatment. Also, it has the potential to improve the lipid profile and eAG parameters in a big way. Insulin resistance and Type 2 diabetes are more likely to happen if you are overweight. In this study, the cinnamomum helped the body mass index of the diabetic rats. Other research has shown that cinnamon can help diabetics. In most cases, type 2 diabetes can be traced back to insulin resistance (IR). Cinnamon can help diabetics. Other studies have shown that cinnamon may increase the efficiency of PPAR 28. To lower cholesterol levels, PPAR-activity could be used to inhibit LDL receptors. 29. Microvascular and macrovascular complications of diabetes mellitus may be averted by cinnamon. 30. Several analyses of the chemical structure of the polyphenolic compound Cinnamomum have shown that this is a big problem that needs to be fixed. It was also found that obese people could lower their triglyceride levels by taking 1 gram of cinnamon every day for a month. The Framingham Heart Study shows that having a high HbA1c level is a strong predictor of having type 2 diabetes. 27. There was also evidence that a small amount of cinnamon helped lower bad cholesterol (LDL-C) and total cholesterol (TC). In the Nano-Cinnamomum group, there were statistically significant differences between the levels of TC, TG, LDL-C, and HDL-C in the serum before and after treatment.

**Conflict of interest**

The authors have nothing to say about a conflict of interest.

**Conclusion**

These findings point to the possibility that Nano-Cinnamomum can reduce levels of HbA1c in people who have type 2 diabetes. Additionally, it has the potential to reduce serum LDL-C and body mass index.

**Compliance with Ethical Standards**

Conflicts of interest The authors declare that they have no conflict of interest.
Ethical approval

Ethical approval for this research was obtained from the Al-Qadisiyah University Local Committee.

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