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Comparing the therapeutic effects of three herbal medicine (cinnamon, fenugreek, and coriander) on hemoglobin A1C and blood lipids in type II diabetic patients

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Original Article

Abstract

BACKGROUND: Cinnamon, fenugreek and coriander are among those herbs that are probably effective in lowering glucose; however, different results have been found in observed studies, and the effectiveness of these herbs is still controversial. This study was designed to compare the effects of three herbs of cinnamon, fenugreek and coriander on hemoglobin A1C (HbA_1C) and blood lipids in type II diabetic patients.

METHODS: This was a double-blind randomized controlled trial study and 150 non-insulin dependent diabetic patients were recruited in the study. Five similar concolor 500mg capsules containing cinnamon, fenugreek, coriander, -a mixture of three herbs-, and placebo were prescribed two capsules every 12 hours. Variables of HbA_1C, fasting blood glucose, cholesterol and triglyceride were tested after 6 weeks. Data were analyzed by chi-square, Fisher's exact test, Mann-Whitney test and one way analysis of variance (one-way ANOVA).

RESULTS: There was no statistical significant difference between the intervention and placebo groups regarding basic characteristics. Man age of patients was 53.76 ± 8.74 years and the disease duration was 8.00 ± 5.66 years. Mean fasting blood sugar (FBS) and HbA_1C was 189.4 ± 51.05 mg/dl and 9.2 ± 1.42 percent, respectively.

CONCLUSION: In type II diabetic patients, herbal medicines of cinnamon, fenugreek, and coriander and their mixture with a daily dosage of 2 g did not have any stronger effect than the placebo on lowering blood glucose, HbA_1C, and blood lipids; it might be the result of several factors including prescribing little amounts of medicine, short period of intervention, and ineffectiveness of the mentioned herbs.

KEYWORDS: Diabetes, Cinnamon, Fenugreek, Coriander, Hemoglobin A_1C, Blood Lipids

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Introduction

Type II diabetes is the most common metabolic disease all over the world[1] and right now 1.2 million diabetic patients live in Iran.[2] Medicine-therapy of diabetes is conducted through using anti-glucose drugs including biguanides, thiazolidinediones, sulfonylureas, D-phenylalanine derivatives, etc.[3] Due to several different side effects of these medications, there is a growing tendency toward finding medications with less subsidiary effects and as a result therapeutic herbs are taking lots of attention. The World Health Organization (WHO) has listed 21000 herbs which are used as medicines all over the world[4] and this magnifies the importance of herbs in curing diseases. According to previous studies, some herbs are effective in lowering blood glucose.[4-9] Their mechanism includes lowering glucose absorption in intestine, increasing glucose consumption in body, creating glycogen in liver,

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enhancing phosphorylation of glucose receptors, and increasing insulin sensitivity.[6,10-15]. However, in different studies performed using these herbs, different results have been observed and some quantitative researches were applied on human samples.[9,16-19]

Because of the cost-effectiveness of them and trivial risks, finding effective therapeutic herbs can be more favored by diabetic patients; therefore, introducing effective drugs for diabetes can make a significant revolution in curing diabetes. This study, hence, was performed to compare the effects of three herbs of cinnamon, fenugreek, and coriander to the effects of placebo on lowering HbA_1C and blood lipids in type II diabetic patients.

Materials and Methods

This was a double-blind randomized controlled trial study and included insulin-independent diabetic patients who referred to diabetes center of Yazd, Iran. Based on confidence interval 95%, power 90%, standard deviation (SD) 1.3% for HbA_1C, and taking the least significant difference for 1% in lowering the HbA_1C mean, the sample size required for the study was estimated 27 people for each group and as a result we had 150 people in five groups as the total sample size; and simple randomization was used for distributing participants in five groups.

Randomization was done by a well-trained nurse, and 31 subjects were allocated to coriander group, 31 to cinnamon group, 29 to fenugreek group, 29 to three-herbs mixture group, and finally 30 to the placebo group. In total, 193 individuals were analyzed from which 43 subjects did not match the inclusive criteria, and 3 subjects in placebo group, 5 in coriander group, 3 in cinnamon group, 4 in fenugreek group, and 1 in three-herbs mixture group were excluded from the study because they did not come back on time for follow-up activities (Figure 1).

Inclusive criteria included type II diabetic patients with fasting glucose 140 to 350 mg/dl who were taking food diets or edible anti-diabetes drugs. Exclusive criteria were any history of allergy to fenugreek or pea (because of intersecting reaction with fenugreek), taking

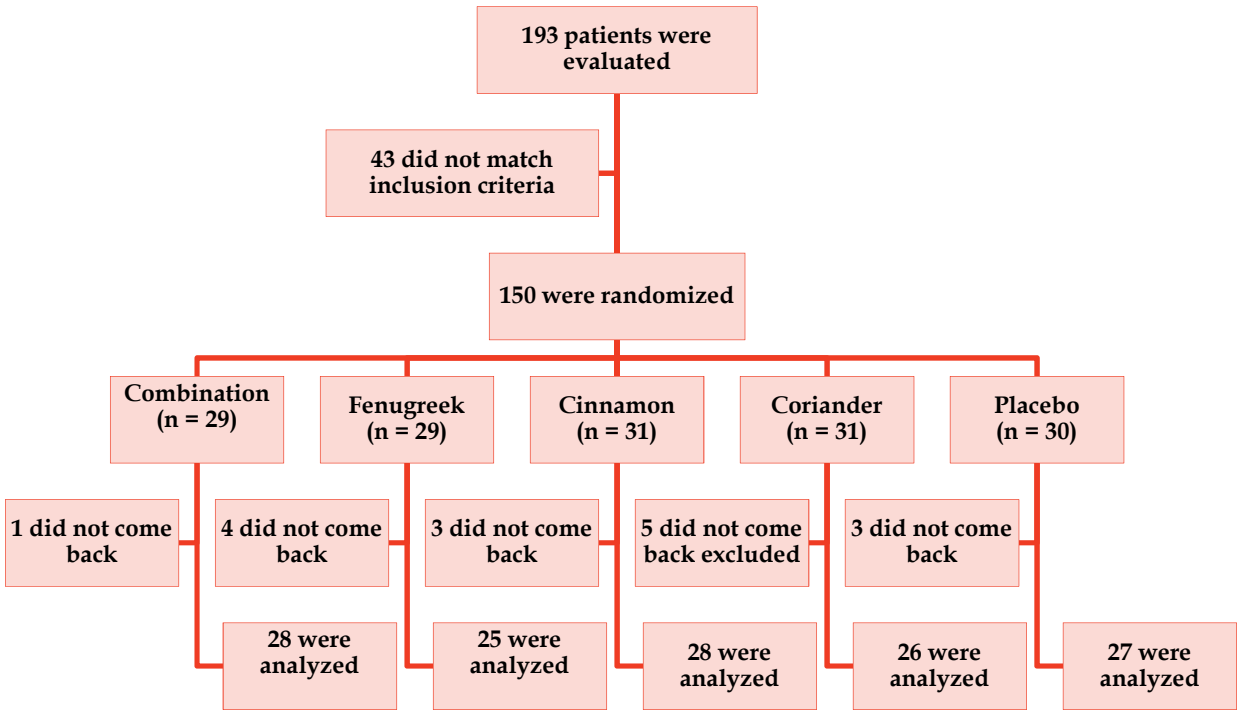

Figure 1. Patients' follow-up diagram

anti-clotting drugs or any history of coagulation disorders, alteration of anti-diabetes drugs or treating hyperlipidemia during the study, treatment with insulin, renal disorders or diabetic nephropathy, congestive heart failure, history of cerebral apoplexy during last previous month, chronic liver disease, chronic digestive diseases and ulcer peptic, asthma, bronchospasm and wheezing, and history of taking herbal medicines and vitamins in the last two weeks, pregnancy and breastfeeding. At the beginning of the study, HbA_1C variable as the major indicator and fasting blood glucose (FBS), cholesterol, triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein (HDL) as minor indicators were tested by an authoritative laboratory.

For six weeks, every 12 hours, patients took two similar 500mg capsules of herbal drugs and placebo (pea flour) and after 6 weeks, indicators were re-measured. Patients were trained to discontinue and withdraw the drug or counsel diabetes center whenever they experienced respiratory distress, pain in chest, hives, rash, itching, skin inflammation, or hypoglycemia. Patients were visited weekly by physicians and their hypoglycemia and hyperglycemia were monitored and controlled and if their blood glucose was under 60 or above 350 mg/dl, proper cares were applied.

After entering data into SPSS for Windows (version 11.5, SPSS Inc., Chicago, IL, USA), the pre and post status of each variable was calculated. Then, chi-square and Fisher's exact tests were used to compare quantitative variables, and Mann-Whitney U test was used to compare the quantitative variables of intervention with the placebo group. And finally, the differences in outcomes between the subjects were assessed using one way analysis of variance (one-way ANOVA).

Results

This study included 27 males (18%), 123 females (82%), and among them 22 subjects were affected by neuropathy (14.7%), 2 by retinopathy (1.3%), 27 by blood pressure (18%), 69 by hyperlipidemia (46%), and 3 were cigarette smokers; there was no statistical significant difference between the intervention and placebo groups. None of the patients were suffering from nephropathy or diabetic foot sores. The mean age of patients was 53.67 ± 8.7 years, duration of diabetes 8 ± 5.6 years, and they took 2.23 ± 1.1 Glibenclamide pills and 2.4 ± 0.82 metformin, and there was no statistical significant difference between the intervention and placebo groups. The mean of body mass index (BMI), FBS and HbA_1C in all the participants were 29.5 ± 4.2, 191.3 ± 51.9 mg/dl and 9.23 ± 1.4%, respectively. There was no statistical significant difference between the intervention groups and placebo group in primary assessment (pre-intervention phase) regarding all the variables (Table 1).

Table 1. Comparing the intervention groups and placebo according to some variables

Variables	Placebo (n = 30)	Cinnamon (n = 31)	Fenugreek (n = 29)	Coriander (n = 31)	Combination (n = 29)
Sex					
Male	7 (23.3)	9 (29)	4 (13.8)	4 (12.9)	3 (10.3)
Female	23 (76.7)	22 (71)	25 (86.2)	27 (87.1)	26 (89.7)
Retinopathy	0 (0)	0 (0)	1 (3.4)	1 (3.2)	0 (0)
Neuropathy	4 (13.3)	3 (9.7)	3 (10.3)	7 (23.3)	5 (17.2)
Hypertension	7 (23.3)	3 (9.7)	6 (20.7)	6 (19.4)	5 (17.2)
Hyperlipidemia	14 (46.7)	12 (40)	16 (55.2)	12 (38.7)	15 (51.7)
Smoking	3 (10%)	0 (0)	0 (0)	0 (0)	0 (0)
Age (Mean ± SD)	53.1 ± 8.4	56.1 ± 9.8	52.3 ± 8	52 ± 7.9	54.3 ± 8.8
Duration of diabetes (Mean ± SD)	7.4 ± 4.8	7.5 ± 6.3	7.9 ± 5	7.4 ± 5.5	9.9 ± 6.1
BMI (Mean ± SD)	30.7 ± 3.3	29.6 ± 4	28.9 ± 5.1	29.7 ± 4.9	28.7 ± 3.5

There was no statistically significant difference between the placebo and intervention groups using chi-square, Fisher's exact test and Mann-Whitney U test to compare intervention with placebo groups.

There was no statistical significant difference between the study groups regarding lowering HbA_1C and other variables. Patients did not represent any allergic effect caused by drugs or placebo (Figures 2-7).

Discussion

In this study, no statistical significant difference was found in the two groups before applying interventions regarding the specified variables. Comparing with placebo, prescribed medicines

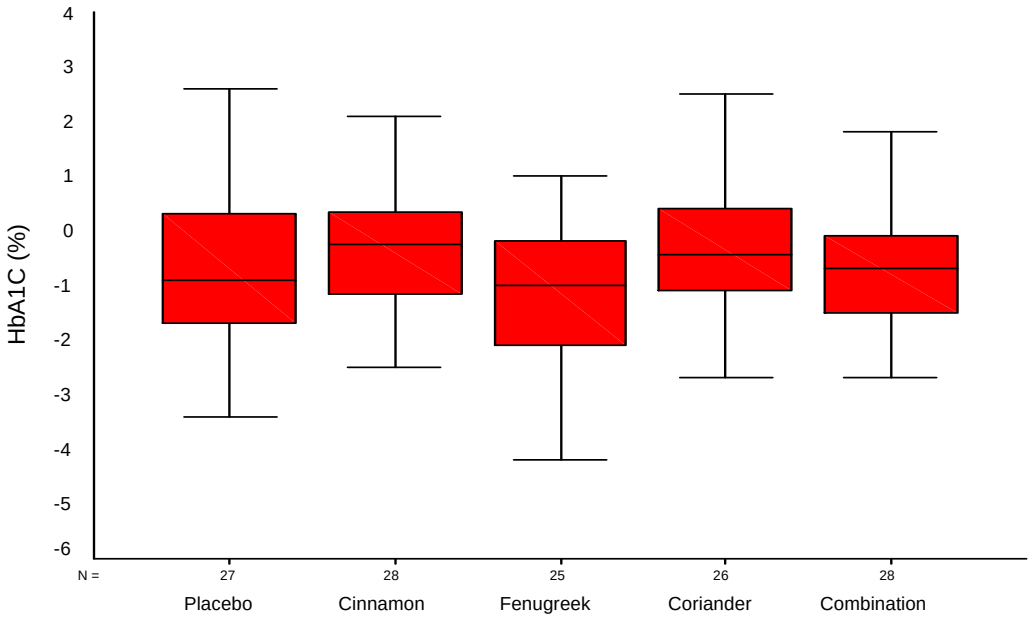

Figure 2. Alteration of hemoglobin A1C (HbA1C) (after minus before) value in the subjects
The median, minimum (Min), and maximum (Max) values and the values for quartile 1 (q1) and quartile 3 (q3) are shown. There was no statistical significant difference between the study groups using Kruskal-Wallis test (P = 0.382).

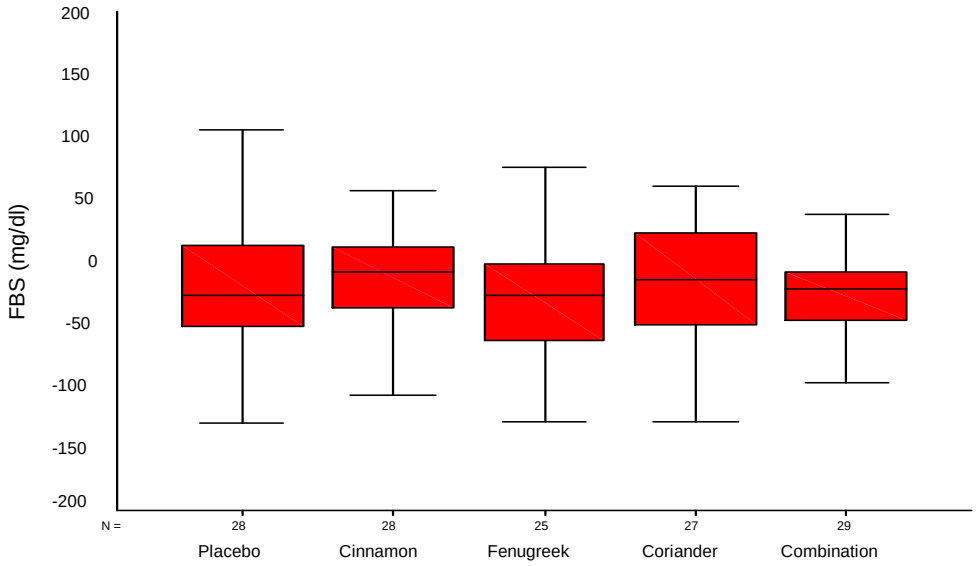

Figure 3. Alteration of fasting blood sugar (FBS) (after minus before) value in the subjects
No statistical significant difference was found between the study groups using one-way ANOVA (P = 0.569).

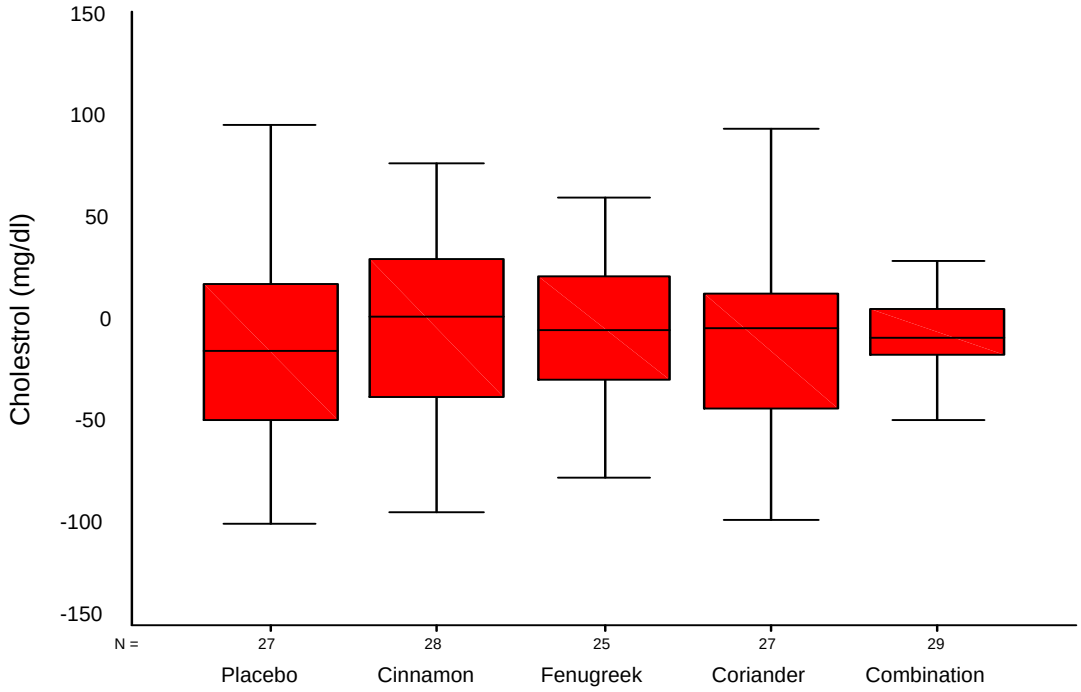

Figure 4. Alteration of cholesterol (after minus before) value in the subjects
No statistical significant difference was found between the study groups using one-way ANOVA (P = 0.944).

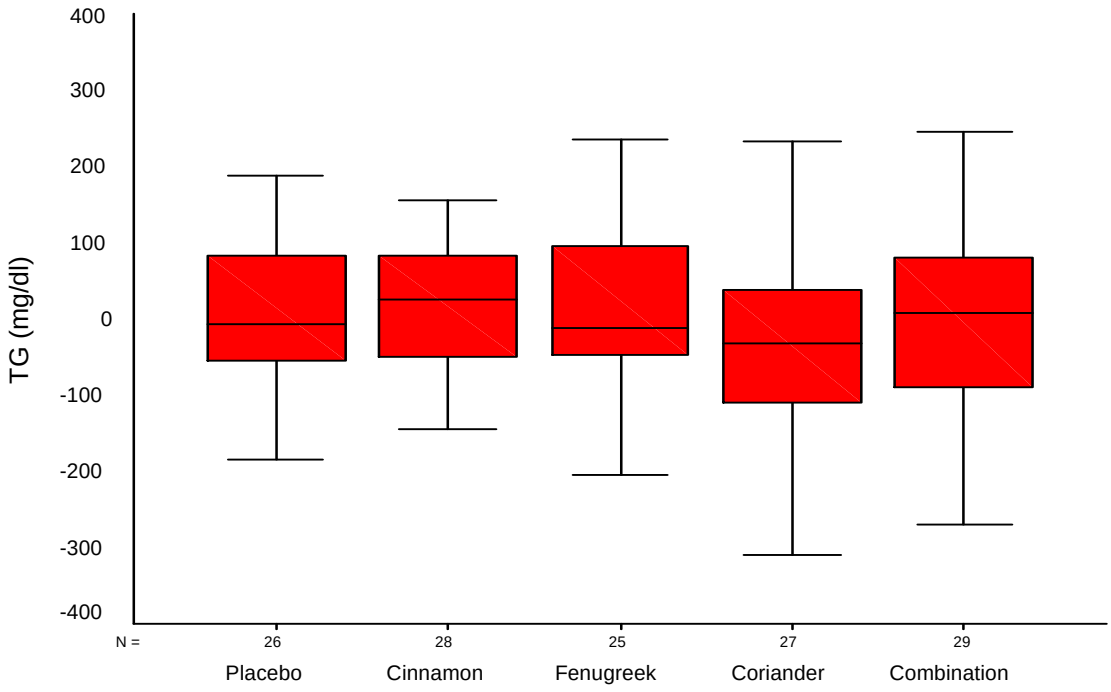

Figure 5. Alteration of triglyceride (TG) (after minus before) value in the subjects
No statistical significant difference was found between the study groups using one-way ANOVA (P = 0.398).

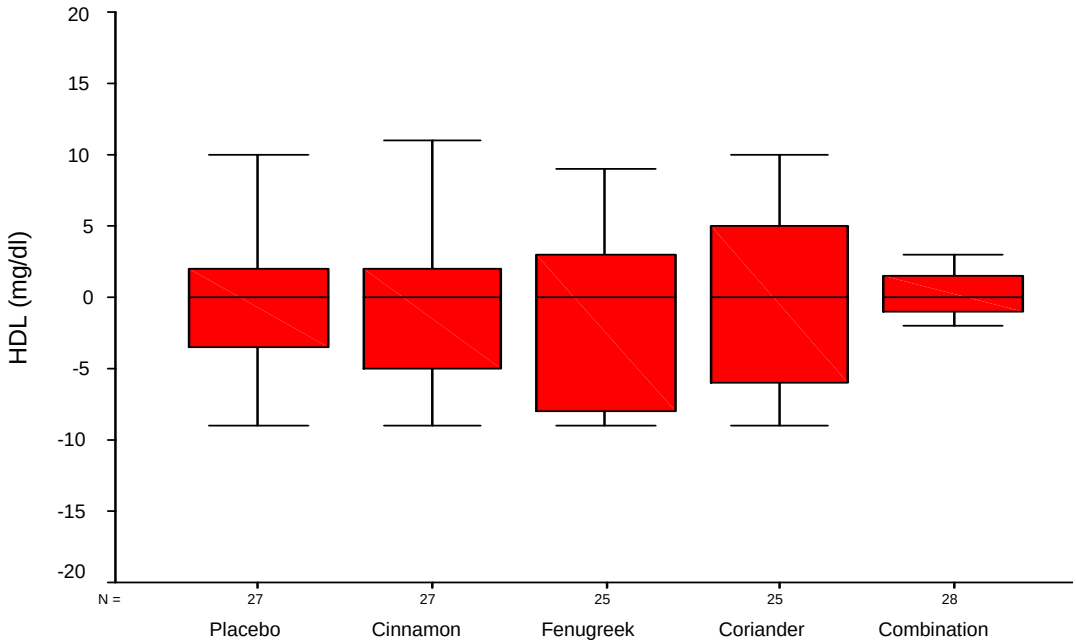

Figure 6. Alteration of high density lipoprotein (HDL) (after minus before) value in the subjects
No statistical significant difference was found between the study groups using one-way ANOVA (P = 0.998).

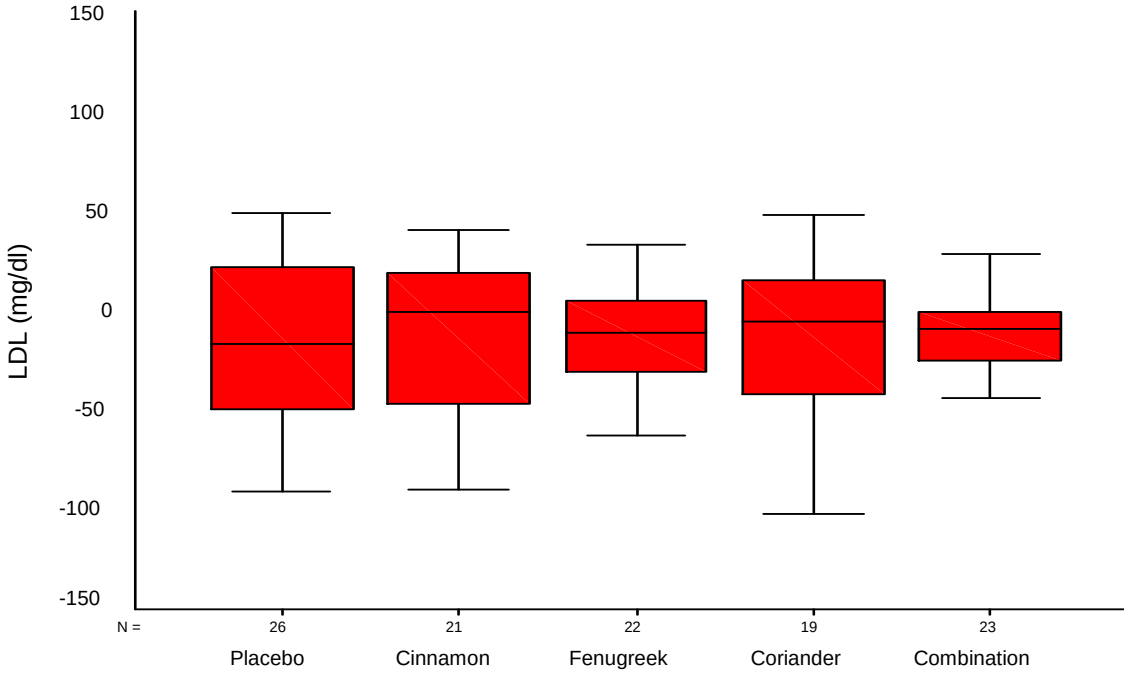

Figure 7. Alteration of low density lipoprotein (LDL) (after minus before) value in the subjects
No statistical significant difference was found between the study groups using one-way ANOVA (P = 0.956).

containing cinnamon, fenugreek, coriander and their mixture did not have any significant effect on lowering HbA_1C which is a good indicator for assessing blood glucose control.[20] Besides, their effects were not diverse in other groups, regarding other variables including cholesterol,

triglyceride, LDL, etc. multi-variable analysis for other probable confounder factors represented that treatment group did not have any effect on lowering HbA_1C.

In the study of Khan et al. in Pakistan,[21] the exact amounts of 1, 3 and 6 g of cinnamon that was taken for 40 days significantly reduced levels of glucose, cholesterol, triglyceride, and LDL in type II diabetic patients, comparing to those levels in control group and similar results were found in Crawford study.[22] However, in Altschuler et al.,[20] cinnamon did not prove beneficial effects on HbA1C comparing to the control group and studies of Mang and Blevins[16,23] had the same results. In Baker et al. meta-analysis[24] which included several studies, it was demonstrated that cinnamon was not stronger than the placebo in reducing blood sugar, blood lipids and HbA_1C.

In Xue study, implemented on diabetic rats, fenugreek was efficient in lowering blood sugar, HbA1C, cholesterol, and triglyceride though the same effect was not achieved in lower dosages.[25] Nevertheless, in Jelodar et al. fenugreek did not reduce blood glucose in rats.[26] In Sharma study, a dosage of 50 g fenugreek powder, that was taken twice daily, was efficient in reducing 54% of 24-hour glucose-urine excretion in diabetic patients who were insulin-users. In addition, their study demonstrated a significant reduction in cholesterol, VLDL (very low density lipoprotein), and LDL.[27] Gutpa study, in which 25 diabetic patients took part, represented that taking a dosage of 1 g fenugreek seeds daily did not make any statistical significant change comparing to the control group (2 hours after taking drugs and also 2 months later); however insulin sensitivity was increased and TG was decreased.[28] His collogues showed that fenugreek essence reduced blood glucose by 58% in diabetic rats.[29] Moreover Kannappan and Anuradha showed that using fenugreek seeds can increase cells susceptibility to insulin and this effect was comparable to the metformin.[30] In Bordia et al. 2.5 g of fenugreek seeds powder was prescribed to be taken twice each day for 3 months, and obvious reduction of cholesterol and TG was observed.[8] Studies concerning coriander were performed on animals and there are a few cases of human objected study. It has been proved that coriander can reduce glucose and lipid in rats[18] and it has demonstrated other effects in other studies such as decreasing glucose, increasing insulin secretion, and pseudo-insulin effects.[19] The mechanisms achieved by these three herbs is being described as lowering glucose absorption in intestine, increasing glucose consumption in body, producing glycogen in liver, increasing the phosphorylation of insulin receptors, and increasing insulin sensitivity.[6,10,15] However the results of different studies are not completely similar, it might be the result of different disease phases, insulin resistance, different dosages of prescribed drugs, small number of samples, drug consumption interval, and the diversity of food habits in different parts. In seems that for achieving accurate results, we need to do multi-centered controlled trials with sufficient sample size, while we consider insulin resistance status and other effective factors.

One of the limitations of this study was the short time period of the study which did not provide enough time for observing the effects of these medicines in lowering HbA_1C, since red cells life time is 120 days. Therefore studies designed for assessing HbA_1C should last at least 4 months to observe all the curing effects.[7] Another limitation was the small dosages of herbal medicines that were prescribed and in later studies this should be taken into consideration. No especial side effect of drugs was found in this study.

Conclusion

According to this study, cinnamon, fenugreek, coriander and their mixture with a daily dosage of 1 g cannot make any stronger effect than the placebo on lowering blood sugar, HbA_1C, and blood lipids in type II diabetic patients. It might be the result of small dosages of the prescribed drugs, short intervention interval, diversity of disease features in patients, and food habits or diest.

Conflict of Interests

Authors have no conflict of interests.

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