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Effect of cumin powder on body composition and lipid profile in overweight and obese women

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A B S T R A C T

Introduction: This study aimed to determine the effect of cumin powder on body composition and lipid profile in overweight and obese women.
Materials & methods: In this randomized clinical trial, 88 overweight/obese women were randomly assigned into two groups. The experimental group was asked to have 3 g/d cumin powder with yogurt at two meals for 3 months. The same amount of yogurt minus cumin powder was prescribed for the control group. All patients received nutrition counseling for weight loss in a similar manner. Anthropometric and biochemical parameters were determined before and after the intervention.
Results: Cumin powder reduced serum levels of fasting cholesterol, triglyceride, and LDL and increased HDL. Weight, BMI, waist circumference, fat mass and its percentage significantly reduced. It has no effect on FBS and fat-free mass.
Conclusion: Cumin powder in a weight reduction diet showed improvement in anthropometric and biochemical parameters in overweight/obese women.

1. Introduction

Obesity is the most important nutritional disease in developed countries and has rapidly spread in the past two decades. On the other hand, overweight and obesity are among the most important predisposing factors of morbidity and mortality. Obesity can be accompanied by the abnormalities of blood glucose and blood lipoproteins which exposes people to many diseases including diabetes, hyperlipidemia, hypertension, and cardiovascular diseases [1]. Previous studies have suggested that body fat distribution may play a role in the risk of some diseases [2]. Nowadays, many pharmaceutical treatments have been used to control blood lipids and lose weight; but, they have little effects and often induce several side effects [3]. Given that nowadays use of traditional medicine and medicinal plants has become prevalent in the treatment of many diseases. Using of medicinal plants can be a viable alternative for synthetic drugs [4]. Extensive studies have been performed on the effects of different medicinal plants on plasma lipids and weight loss. Cumin, as one of these medicinal plants, contains more than 100 different chemicals, including essential fatty acids and volatile oils [5]. Some studies have shown that cumin may have decreasing effects of blood lipids and weight [6]. However, to the best knowledge of us, the majority of these studies have been done on animals and the published human studies have been conducted on patients suffering from diabetes or hypercholesterolemia [7]. Hence, the present study aimed to determine the effect of cumin powder on body composition and lipid profile in overweight and obese women.

2. Materials & methods

In this randomized clinical trial, overweight and obese women (BMI > 25) were invited to a Nutrition Research Center using a call for research and then topic, objectives, and method of the study were explained to them. After obtaining a written consent, 100 participants who met the inclusion criteria for the study including having 20–60 years old with BMI > 25, lack of any history of diseases and special drug consumption, no previous treatment regimens in the past three months, and lack of weight change by more than 2 kg in the last month were included. Exclusion criteria were as follows: having allergic reactions to cumin, consuming less than

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80% of the prescribed cumin, and failure to follow the prescribed diet. Using a computer random selection, these people were divided into two groups; the control group and the group receiving cumin powder. After 12 h of fasting, 5 ml blood was taken from all the people to Measure fasting blood glucose, triglycerides, total cholesterol, LDL-C, and HDL-C concentrations. Fasting plasma glucose test was performed using the assay kit (Pars Azmoon Co., Tehran, Iran) by glucose-peroxidase method and auto-analyzer device made in Echoplus Company, Italy. Triglyceride and total cholesterol were measured using assay kits (Pars Azmoon Co., Tehran, Iran) by glycerol oxidase and cholesterol oxidase enzymatic methods by the auto-analyzer device made in Echoplus in Company, Italy. HDL cholesterol was measured after the precipitation of beta-lipoproteins by dextran sulfate and chloride magnesium using oxidase cholesterol method and the auto-analyzer device. LDL cholesterol was calculated by Friedewald's formula. Weight (kg) (no shoes, minimum clothing) was measured on a calibrated scale (with accuracy of o.1 Kg), and height (within 0.1 cm) was measured by stadiometer. Waist circumferences were measured using an anthropometric tape measure with accuracy of 0.1 cm. Body composition parameters were assessed using BIA, TANITA Body Composition Analyzer (Model BC-418 MA, Japan) at Nutrition and Food Security Research Centre. Stepping on the weighing platform with bare feet, anterior and posterior electrodes touched subject feet. The hand grips were squeezed by the subject, after stabilizing the body weight figure on the display. The measured parameters included fat mass, fat-free mass, total body fat percentage and the percentage of fat-free mass. Body mass index (BMI) was calculated by dividing weight by square of height.

Single blinding was done as follows: cumin powder along with a diet was prescribed by a dietitian considering the random codes obtained from a random number table. The researcher was blind to the receiver group and another person had the codes. When a participant was visited, her group was announced to the dietitian. Energy calculation was performed for all the participants using Harris–Benedict equation and reduced-calorie diet (500 kcal less than the required level) was prescribed by the dietitian. The experimental group was asked to have 3 g cumin powder [6] along with yogurt at two meals of lunch and dinner (each time 1.5 g cumin + 150 ml low-fat yogurt) on a daily basis. The same amount of yogurt minus cumin powder was prescribed for the control group. Dosage of cumin was selected based on previous study [6] and also its palatability and tolerability by the participants. Length of the study period was 3 months. This period was a bit short but it was enough to show moderate weight loss. We could not extend this period due to possible high attrition rate. In fact, the packages containing cumin powder for one month consumption were given to the patients and the required follow-ups with an emphasis on taking them and getting aware of the probable side effects were done over phone calls. After one month, the participants were asked to return the remaining bags. If more than 20% of them were left, the participant would be excluded from the study.

All patients received nutrition counseling in individual sessions every two weeks in the first month and every month thereafter until 3 months, with biological reevaluation at 3 months. Three day dietary records were used to calculate food and beverage intake at baseline and during intervention for each visit. Each three day record consisted of two weekdays and one weekend. Foods were measured using standard measuring cups and spoons; to maximize the accuracy of the dietary records and corrected by dietitian. No supplements were used by the participants during the study. Participants who consumed less than 80% of cumin packages or did not complete the dietary records were considered noncompliant and were excluded from final analysis. Each food and beverage was analyzed for nutrient intake using Nutritionist IV software (Version 4.1, First Databank Division, The Hearst Corporation, San Bruno, CA) to assess macronutrient and micronutrient contents of foods. The Iranian food composition table (FCT) was used as an alternative for traditional Iranian food items which are not included in the Food Composition Tables for USA (USDA FCT). During the 16-week intensive dietary treatment, the amount of attention given to the groups was exactly the same, in order to reduce the risk of measurement bias.

In a per-protocol analysis, 12 subjects were excluded during the intervention (Fig. 1); in the group receiving cumin powder, three subjects were emergence of cumin allergy. At the end, 88 participants completed the study. Data collected during baseline and weeks 12 of the intervention were compared. The Kolmogorov–Smirnov test was used to test the normal distribution of variables. Descriptive statistics are presented as mean ± SD. For the primary analysis, we used an independent sample *t*-test and paired samples *t*-test. Analysis of covariance (ANCOVA) was used to adjust mean differences on fasting blood sugar for its baseline concentration. All tests were two-sided and *P*-values less than 0.05 were considered significant. All statistical analyses were performed using SPSS 13. The present study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences and Iranian Registry of Clinical Trial (registration no. IRCT2013021112429N1).

3. Results

The current study was a single blind clinical trial, which was performed on 100 overweight and obese women. Among the participants, 88 women completed the study and others were excluded due to not following the diet, traveling, or emergence of cumin allergy. Mean age of the people receiving cumin was 38.06 ± 7.97 years old and mean age of the control group was 36.37 ± 9.01; according to independent *t*-test, it was homogeneous and the groups did not have any significant age differences.

In Table 1, mean intake of energy and macronutrients before and after the study in both groups of receiving cumin powder and control is shown.

According to Table 2, basic data of anthropometric factors including body weight, BMI, waist circumference, weight of fat-free mass, weight of fat mass, and percentage fat mass were not significantly different in the group receiving cumin powder and control group ($p > 0.05$).

According to Table 3, basic data of biochemical factors including concentration of triglyceride, cholesterol, LDL-c, and HDL-c had no significant difference in cumin receiving group and control group ($p > 0.05$). But, concentration of fasting blood glucose was different between groups at the beginning of the study.

As Table 4 shows, at the end of the study, significant body weight reduction was observed in both groups ($p > 0.005$); but, weight loss in the cumin group was higher than that in the control group (−6.20 kg in the experimental group versus −4.19 kg in the control group, $p = 0.005$). In terms of BMI, there was a significant reduction in both groups at the end of the study ($p = 0.005$); but, this reduction was more tangible in the cumin group (−2.35 Kg/m^2 in the experimental group versus −1.31 Kg/m^2 in the control group, $p = 0.005$). Waist circumference had significant reduction at the end of the study in both groups ($p = 0.005$), which was 8.22% in the cumin and 5.51% in the control groups; this reduction was significantly higher in the cumin group ($p = 0.005$). There was no significant change in terms of fat-free mass (ffm) at the end of the study in both groups ($p = 0.48$). Fat mass index (fm) had a significant reduction in both groups ($p = 0.005$); however, this reduction was 18.12% in the cumin group and 10.66% in the experimental group, which was significantly higher in the former

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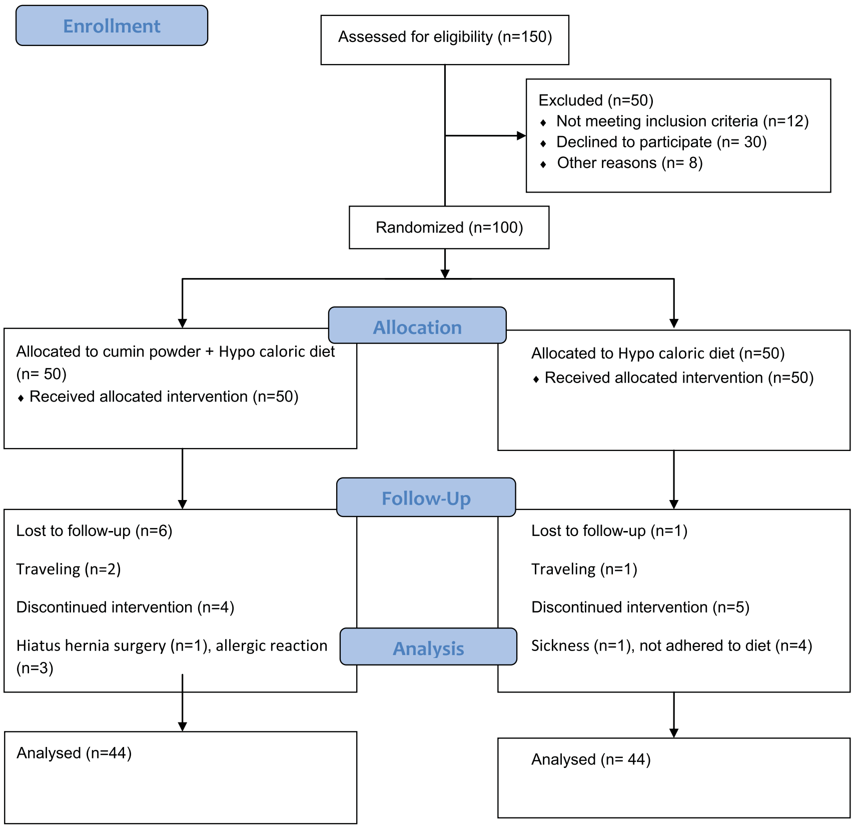

Fig. 1. Flow diagram of the clinical trial steps.

one ($p > 0.005$). Percentage of fat mass (fmp) also decreased in both groups ($p > 0.005$); cumin group (14.64%) demonstrated more reduction than the control one (4.91%) in this regard ($p > 0.005$).

At the end of the study, concentration of triglycerides in the cumin receiving group significantly decreased compared to the baseline ($p > 0.005$). Mean reduction of this variable was different in both groups (−23.06 mg dl in cumin receiving group and −5.04 mg dl in control group, $p = 0.020$). Mean changes in the cholesterol concentrations of the experimental and control groups were −26.48 and −0.88 mg dl, respectively, indicating a significant reduction ($p > 0.005$). In fact, cholesterol concentration had a significant reduction at the end of the study only in the experimental group ($p > 0.005$). LDL serum levels had significant reduction at the end of the study only in cumin receiving group ($p > 0.005$). Mean changes of LDL levels were different between groups (− 9.62 mg dl in cumin receiving group versus 0.44 mg dl in the control group, $p = 0.001$). Cumin consumption only caused a significant increase in HDL concentration in the experimental group at the end of the study ($p = 0.004$). Mean difference of this variable was significant between two groups ($p = 0.049$). Considering the significant difference between both groups at the beginning of the study, fasting blood glucose variable was entered into ANCOVA statistical test as a covariate, the results of which showed that, although concentration of fasting blood glucose was different between the two groups at the end of the study ($p > 0.001$), there was no difference between mean changes of this variable in both groups ($p = 0.18$) (Table 5).

4. Discussion

In the present study, consuming cumin powder was accompanied by reduced serum levels of fasting cholesterol, triglyceride, and LDL and increased serum levels of HDL; but, it had no effect on the serum levels of fasting blood glucose. Meanwhile, adding cumin to a hypocaloric diet reduced weight, BMI, and waist circumference and improved body composition, i.e. reduced fat mass and fat mass percentage but did not change fat-free mass.

The present results in terms of reducing serum level of cholesterol were consistent with those of most animal and human studies [3,6,7,9]. In the studies by Andula and Mohiti, reduction of triglyceride following cumin consumption was reported [6,7]. However, the present findings were not in agreement with some other studies [3,7,8]. In a recent study, Samani reported no significant

Table 1
Mean intake of energy and macronutrients among two groups before and after the study.

Group	Weight reducing diet ($n = 44$)		Weight reducing diet + cumin powder	
	Baseline	After 3 months	Baseline	After 3 months
Energy (kcal)	2470.81 ± 316.85	1920.41 ± 278.75	2501.92 ± 218.25	1900.85 ± 220.62
CHO (% of energy)	64	55	63	57
Pro (% of energy)	12	15	10	13
Fat (% of energy)	24	30	27	30

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Table 2
Baseline measures of the experimental and control groups in terms of anthropometric factors.

Measured parameter	Experimental ($n = 44$)	Control ($n = 44$)	*P*-value
Body weight (kg)	79.43 ± 1.29	76.70 ± 1.20	0.30
BMI (kg m^2)	31.93 ± 5.55	30.29 ± 4.15	0.12
Waist circumference	96.95 ± 7.44	93.73 ± 8.04	0.055
Fat-free mass (kg)	48.05 ± 3.98	47.62 ± 4.76	0.65
Fat mass(kg)	31.40 ± 9.93	29.60 ± 8.01	0.34
Fat mass percent (percent)	38.70 ± 5.70	37.57 ± 4.09	0.28

Table 3
Baseline measures of biochemical factors in the experimental and control groups.

Measured parameter	Experimental ($n = 44$)	Control ($n = 44$)	*P*-value
TG (mg dl)	137.6 ± 5.81	138.8 ± 5.57	0.92
ChoL (mg dl)	179.47 ± 3.55	181.18 ± 4.38	0.84
LDL-c (mg dl)	112.40 ± 2.71	116.06 ± 2.84	0.54
HDL-c (mg dl)	47.74 ± 6.89	49.28 ± 9.43	0.38
FBS (mg dl)	90.93 ± 1.39	96.42 ± 1.04	0.04

changes in HDL-C, LDL-C, total cholesterol and triglyceride after 45 days of cumin supplementation in hypercholesterolmic patients [8]. The discrepancies of the results may be partially due to the difference in the types of studied populations, different forms of cumin supplement, and the duration of the studies. Hypocholesterolemic effect of cumin could be partly attributed to its glycoside saponins which prevent cholesterol absorption and increase its fetal excretion by interfering with its enterohepatic circulation [10]. Moreover, cumin seeds have a substantial amount of some phytosterols such as beta-sitosterol, delta5-avenasterol, and delta7-avenasterol. Cumin has also stigmasterol, campesterol and lanosterol in small amounts [11]. Phytosterols displace cholesterol from intestinal micelles, reducing absorbable cholesterol. We don't measure fecal cholesterol in this study. But, Hayes et al. showed increase of fecal cholesterol in gerbils fed diets containing free and esterified sterols and stanols [12]. Other probable mechanisms regarding to hypocholesterolemic effect of cumin may be related to up-regulation of the LDL-C receptor and inhibition of 3-hydroxyl-3-methylglutaryl coenzyme A reductase [13].

Decreasing effect of cumin on LDL is in agreement with other studies. Also, some studies [3,6,7] have reported increase in HDL-C concentration following cumin consumption in their results; in contrast, HDL did not significantly change in the study by Heidari and Alnavazi and samani.

Most studies [6–8] have noted the reduced level of fasting blood glucose following cumin consumption, which is in consistent with the results of this study. Such contradiction could be attributed to the point that other studies have been performed on animal models, some of which were done on diabetic patients, whereas the participants of this study were in the normal range of fasting blood glucose from the beginning. It can be due to differences in the type and dose of prescribed cumin in different works. It is important to note that hypoglycemia is not a potential side effect of cumin supplementation in healthy subjects who may use this spice to gain other health benefits. Heidari et al.'s study is the only work in which weight loss was noted following cumin consumption. In two other studies [3,8] in which cumin effect on body weight was examined, no considerable changes were reported at the end.

Table 4
Changes in anthropometric factors in the experimental and control groups.

Measured parameter	Experimental ($n = 44$)	Control ($n = 44$)	*P*-value
Body weight (kg)	−6.20 (−7.92%)	−4.19 (−5.54%)	0.005
BMI (kg m^2)	−2.35 (−7.14%)	−1.31 (5.54%)	0.005
Waist circumference	−8.02 (−8.22%)	−5.94 (−5.51%)	0.005
Fat-free mass (kg)	−0.04 (−0.83%)	−0.34 (−0.71%)	0.48
Fat mass (kg)	−5.51 (−18.12%)	−3.75 (−10.66%)	0.005
Fat mass percent (percent)	−5.99 (−14.64%)	−3.79 (−4.91%)	0.005

Table 5
Changes in biochemical factors in the experimental and control groups.

Measured parameter	Experimental ($n = 44$)	Control ($n = 44$)	*P*-value
TG (mg dl)	−23.06 (−12.8%)	−5.04 (−0.88)	0.02
Chol (mg dl)	−26.48 (−13.9%)	−0.88 (−4.1%)	0.005
LDL-c (mg dl)	−9.62 (−7.19%)	0.44 (1.84)	0.001
HDL-c (mg dl)	1.84 (3.4%)	−0.82 (−0.31%)	0.049
FBS (mg dl)	−5.95 (−6.1%)	−3.82 (−3.6%)	0.18

5. Conclusion

Our literature review revealed that, regarding the results in terms of body composition, this study was the only investigation that examined effect of cumin on body composition.

Regarding the limitation of our study, we can point to the study group which consisted of overweight/obese women. So, the results could not be generalized to other groups. Investigating the effect of cumin among different group of people such as diabetic and dyslipidemic patients with various doses and duration will give better results.

These data support the efficacy of cumin supplementation on reducing TG, LDL-C, total Chol, and improving body composition and HDL-C in overweight and obese women and suggest that this naturally-occurring spice can reduce risk factors associated with metabolic syndrome.

The authors' contributions were as follows – AN and RZ: design HF: analysis; RZ, AN: data collection, analysis, and article preparation.

Conflict of interest statement

None of the authors had any financial or personal conflicts of interest.

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