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Research Article

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Effect of cumin extract with exercise training on some metabolic parameters and body composition in obese middle-aged men suffering from metabolic syndrome

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ABSTRACT

Metabolic syndrome is a set of conditions in which heart disease, stroke and diabetes increases. Exercise training and taking certain herbal remedies have been introduced as a prevention and treatment for it. Accordingly, aim of this study was to investigate cumin extract with combined exercise training on some metabolic parameters of people suffering from it. Participants of the study included 30 obese middle-aged men who had at least one symptom of metabolic syndrome. Participants were randomly divided into three groups of control, combined training, and training with cumin extract use. Training group had a combination of endurance and resistive training for 8 weeks 3 times a week and group of training and cumin extract received 20 mg of cumin extract before training. Control group did not have any training. Blood samples were taken from all three groups and sent to laboratory to measure metabolic variables. Results showed that density of total triglycerides and total cholesterol in training groups compared with the control group decreased significantly, but in group which training with cumin extract were used decrease of total cholesterol was more than other two groups. In addition, LDL density decreased only in the group that had used cumin. This suggests that cumin extract use with exercise training can have better interactive effect on some of metabolic parameters in comparison to exercise training alone.

Key words: Combined training, Cumin extract, Metabolic parameters, Body composition, Obese middle-aged men.

INTRODUCTION

Metabolic syndrome is a set of risky factors with metabolic origin which are known as having at least three factors of five abdominal obesity, high blood pressure, high triglycerides, low HDL- cholesterol, and insulin resistance[1].Incidence of some diseases such as cardiovascular disease, diabetes, cerebrovascular disease, and sudden death in people suffering from metabolic syndrome is higher than in normal people and catching this syndrome increases the deaths of these individuals by 80% [2].Some of them such as genetics, age, and sex are

unchangeable, but some such as high blood pressure, diabetes, and overweight can be modified through lifestyle changes [3].

Overweight and obesity are conditions of metabolic syndrome which can be followed up, modified, and treated through a lifestyle and applying specific methods. One of these methods and styles is doing sport activities [2].Due to diversity of sports activities (resistance, aerobic, strength, anaerobic, etc.), different patterns and subjects have been considered on effect of sports activities on lipid profile. It seems that resistance training in comparison with aerobic activities has a minor effect on lipid profile due to a slight increase in heart rate and metabolism [4,5].However, increase of muscle mass, carbohydrates use, and increase of enzymes`activity and hormones associated with the transfer and use of glucose in muscle cells could probably lead to improvement of some parameters associated with metabolic syndrome because of doing resistance training[1,3,6].Therefore, it is likely that endurance and resistance training have beneficial effects on metabolic syndrome parameters if they are used simultaneously[4,8].

Changing nutritional patterns and specifically use of some medicinal herbs are factors affecting body's metabolic factors so that today various medicinal herbs have widely been spread in treatment of many diseases and also improvement of sports performances (strength and endurance). One of these herbs is cumin which studies conducted on it have indicated that it is traditionally used in treatment of cardiovascular diseases and has a decreasing effect on triglycerides, cholesterol and body weight in normal and diabetic mice [9,10,11]; therefore, it is likely that consumption of cumin extract and doing combined trainings have additional effect on lipid profile. Regarding proven effects of different kinds of cumin in human and animal subjects suffering from diseases such as diabetes and hyperlipidemia[10,11,12,13] and important role of types of exercise training on parameters associated with these diseases [14],the main research question of present study is whether a course of combined training with consumption of cumin extract has more effect on lipid profile of obese middle-aged individuals having metabolic syndrome in comparison to training alone or not?

MATERIALS AND METHODS

Subjects: design of the study was quasi-experimental with two experimental groups and one control group. A number of 30 men with metabolic syndrome participated in the study that after initial assessment of parameters of syndrome were randomly divided in four groups of 10. Subjects of this study had at least three conditions of metabolic syndrome while all of them had body mass of over 30 and in the past year had a history of regular exercise. General characteristics of the subjects have been provided in separate research groups in Table 1.

Table 1: General Characteristics of Subjects

	Age	Height	Weight	Body Mass Index
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Control	40.87±9.63	174.03±11.23	96.98±9.12	32.02±0.66
Training	39.45±8.75	173.48±10.54	97.78±8.89	32.49±0.59
Training and Cumin	38.65±8.54	175.23±10.98	97.00±9.25	31.59±0.59

Data collection: In order to collect data on variables of the study, first questionnaires which considered disease records, physical activity level of individuals, history of suffering from disease, medicine consumption, and history of supplement use were completed. Then, in a briefing, subjects were familiarized how to perform resistant movements and anthropometric characteristics including height, weight, body mass index, and body fat percentage was measured. Next day, maximum power was measured using one repetition maximum in six leg press, bench press, front leg, armpits electricians, back of legs and armpits boat in order to control exercise intensity.

Three days later, subjects participated in the first session of training. One day before the first training session, fasting blood samples were taken from the brachial vein at a rate of 10 cc for measuring lipid profile. Experimental groups training program included eight weeks of concurrent training 3 sessions in week, each session was 75 minutes.3 days after the last training session, blood samples were taken from the participants with the same conditions in pre-test and sent to the laboratory.

Supplementary of cumin extract: In this study, cumin extract was provided in a way that first 5gr of powdered cumin fruit mixing with 500 ml water was brewed; then, cooled, filtered, and finally dried. When using, 20 mg of cumin extract (per kilogram of body weight) was solved in 6 ml water and used[11,15,16].

Training Protocol: In the present study, training protocol included 8 weeks performing combined resistant and aerobic exercises which conducted with frequency of three sessions in a week by both groups of combined training and combined training with cumin by taking into account principle of overload. Resistance training protocol in this study was used in such a way that all the large muscles of body were used. In order to control the intensity, one repetition maximum (1- RM) was used. Total exercise time included80-90 minutes and the first 15 minutes included warming up on the treadmill with intensity of 50% to 60% of maximal heart rate. Then, six movement of resistance exercise including leg press, bench press, front leg, electricians armpits, back of legs and armpits boat was performed in 4 sets with 12 repetitions and intensity of 60 to 70 percent of a one repetition maximum. Rest time between each movement was 90 seconds and between each two sets 60 seconds. Duration of resistance exercise was 40 minutes. To observe the principle of overload and gradual progress in weeks 2,4 and 6 (1- RM) was measured again and based on its measurement, intensity of the exercises were increased. Aerobic exercise program consists of running in which subjects exercised at first and second week for 25 minutes with 65% of maximum heart rate and at weeks 3 and 6 for 30 minutes at 65 to 70 percent of maximum heart rate and at week 6 to 8 for 35 minutes with 70 to 75 percent of their maximal heart rate. At the end of each session, 5 minutes cool-down exercise was intended. Training plan of both groups was equally held at 16 to 18 o`clock for 75 to 90 minutes.

Combined training plus cumin group received cumin one hour before performing activity and combined training group received placebo instead of cumin extract. Control group received no intervention during the period under investigation and participated only in pre-test and post-test. In this study, required recommendations were made to research groups to maintain daily activities and necessary advice to maintain a diet was given to the participants by the dietician.

Data analysis

In this study, according to the normal distribution of data, One Way ANOVA was used to compare the mean differences between groups after obtaining the data changes between before and after 8 weeks. Statistical analysis was conducted using SPSS software (version 16) at the significant level ($P \leq 0.05$).

RESULTS

Table 2. Mean and standard deviation of variables in the experimental and control groups

Variables	Groups	Pre-test	Post-test
		Mean ± SD	Mean ± SD
Fat Percent	Control	35.32±3.45	35.00±3.45
	Combined training	34.01±3.56	33.03±3.53*
	Combined training with Cumin extract	34.24±3.58	31.97±3.41*#
Total Cholesterol (mg/dl)	Control	217.64±9.15	215.96±9.22
	Combined training	221.92±9.16	215.29±9.14
	Combined training with Cumin extract	226.55±8.29	202.78±8.11*#
Low-density lipoprotein (mg/dl)	Control	159.03±9.98	156.73±9.88
	Combined training	167.50±8.02	153.99±8.32
	Combined training with Cumin extract	171.42±6.84	155.41±7.13*
High-density lipoprotein (mg/dl)	Control	51.44±6.43	53.45±6.42
	Combined training	46.21±6.30	49.86±6.39
	Combined training with Cumin extract	52.29±6.53	55.72±6.43
Triglyceride (mg/dl)	Control	187.42±31.98	189.26±29.03
	Combined training	190.12±27.76	183.63±27.87
	Combined training with Cumin extract	179.74±28.29	172.96±30.73
Fasting Blood Sugar (mg/dl)	Control	119.77±8.49	119.18±8.51
	Combined training	121.70±8.84	122.29±8.65
	Combined training with Cumin extract	121.61±8.66	120.11±8.61

Measured variables in three groups have shown in Table 2.Data analysis shows that cumin consumption with training result in significant decrease in density of total cholesterol compared with control group (p=0.001) and training group (p=0.003). Training group+ cumin had significant decrease in density of LDL compared with the control group (p = 0.003), but there was no significant difference in the concentration of these variables (p =

0.135)with training group. Fat percentage of Cumin + training group significantly reduced in comparison with training ($p = 0.001$) and control ($p = 0.001$) groups. Fat percentage of training group also had significant decrease in comparison to control group ($p = 0.002$). However, total triglyceride density has not had significant difference among the three groups ($p = 0.143$).In addition, LDL and fasting blood glucose density did not have any significant difference after 8 weeks of training in groups ($p = 0.267$ and $p = 0.225$).

DISCUSSION

Results of present study showed that combined training results in fat levels decrease and improvement of body compositionin people suffering from metabolic syndrome. This effect on individuals who had used cumin extract while performing trainings was higher. Also, cumin extract consumption while training could reduce cholesterol density and low-density lipoprotein (LDL) blood of those suffering from metabolic syndrome. It shows that cumin extract use plus exercise training could have better effect on body composition and also some lipid parameters of metabolic syndrome patients. The results of studies on diabetic and hyper-cholesterolemic rats suggest that consumption of cumin and caraway radish extract significantly affects cholesterol and lipoproteins in plasma [13,15,17]. Additionally, cumin has antioxidant, anti-bacterial, and improvement of heart muscle contractility effects[3,16].Therefore, it may be useful to prevent cardiovascular disease. Accordingly, doubled reducing effect from combined training and cumin extract use on lipid profile and other cardiovascular variables in humans is not far-fetched.

Cumin extract contains ingredients which the most important of them are cuminol, alcohol cuminol, Simonin, alpha-Pinene, beta-Pinene, gamma-terpinene, phellandrene, sinol, 1 and 3 para mntadyn-7- which has already been reported by authors[18].Mechanism of these compounds` effect on triglyceride and cholesterol serum levels is not specific but possible suggested mechanism were proposed to explain the results that include reduction of cholesterol absorption from the small intestine via linking to the bile acids in intestine and increase of secretion of bile acids [9], decrease of activity of 3-hydroxy -3-methyl Glutaryl coenzyme A reductase (key enzyme of cholesterol re-building), decrease of required NADPH for cholesterol synthesis and fatty acid synthesis to reduce further cholesterol synthesis [12,13,15]. Cumin ingredients cause stimulation of glucose entry into cells and also activity of peroxisome proliferators-activated receptor (PPARγ) in tissues[10,12]. PPARγis a group of transcription factors of genes which play role in acts such as the absorption of fatty acids and saving them, glucose metabolism, and inflammatory processes. Ingredients found in cumin also reduces glucosidase enzyme activity, thus inhibits absorption of glucose from intestine. This can lead to low blood sugar [19].In the present study, reduction of blood sugar in consumer group was not significant; it seems that duration of cumin use and consumption dosage can be a decisive factor in determining the property of cumin.

Dhandapani (2002)reported that consumption of cumin is effective on some blood lipid parameters. They put mice under cumin extract diet for six weeks and concluded that consumption of cumin extract result in significant decrease of TG and TC in diabetic rats. The result is parallel with results of present study.

It seems that lipid-lowering effect of cumin may be as a result of a direct reduction in blood glucose [11,12]. As in the present study, change of factors which were directly related to blood sugar was very evident. On the other hand, it is stated that cumin has antioxidant properties[20]; this could reduce capacity of lipids for oxidation and by stabilizing lipid membrane reduce oxidative stress. Therefore, regarding structural similarity of different types of cumin, these reasons can be taken into account on effect of cumin extract on TC. Overall, it can be found that consumption of cumin extract with exercise training is effective on lipid parameters and recommend its use in patients with diabetes, hyperlipidemia and metabolic syndrome.

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