



The effect of 8 weeks of resistance training and women's supplements on vaspin and insulin resistance in overweight inactive women of Tehran

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Abstract

The purpose of this study was the effect of 8 weeks of resistance training and women's supplements on vaspin and insulin resistance in overweight inactive women of Tehran. Materials and methods: In this study, 32 of the inactive women in Tehran were overweight out of a population of 67. (body mass index between 25 and 30 and fat percentage more than 35%) were selected in 4 groups: 1: supplement, 2: exercise, 3: exercise+supplement 4: control. The training group participated in resistance training for 8 weeks. . The Zinian supplement group consumed 7.5 mg/kg of Zinian extract (thymol) produced by the Jihad University Medicinal Plants Research Institute daily with breakfast. Findings and results: The results showed that 8 weeks of training and Zinian supplement consumption caused a significant decrease in levels vaspin and insulin resistance ($p < 0.05$). Conclusion: The results showed that eight weeks of resistance training and women's supplement use reduced cardiovascular risk symptoms and weight loss.

Key Words: Rt, Vaspin, Insulin resistance, Thymol, Overweight



Introduction

Today, the incidence of chronic diseases in developing countries is higher than in developed countries. Metabolic syndrome is one of the common and increasing diseases in the world, and its root causes are overweight or obesity, physical inactivity, and genetic factors. Metabolic syndrome is closely related to the metabolic disorder "insulin resistance" in which the sensitivity of body tissues to the normal function of insulin is disturbed. Most people with metabolic syndrome also have abdominal obesity. Metabolic syndrome increases the risk of cardiovascular diseases (1). The prevalence of overweight and obesity in adolescents and adults in the world is known as a critical factor for health. In particular, obesity is the main cause of insulin resistance and a number of metabolic disorders. Obesity starts in childhood and often continues until adulthood (2). Today, obesity is considered one of the most important causes of death and chronic and fatal diseases. Obesity refers to excessive accumulation of fat in the body. In addition to storing and releasing triglycerides, adipose tissue can secrete many proteins that play a role in cholesterol metabolism, immune system activation, energy expenditure regulation, insulin action, and nutrition (3). They belong to a wide range of proteins that secrete adipocytes more and are involved in many types of physiological or physiopathological processes, including immunity and inflammation (4).

Vaspin (serpin derived from visceral adipose tissue) is a molecule of the adipokines family that was recently introduced and described and seems to be related to metabolic risk factors (5) and also has the effect of causing insulin sensitivity (6). The level of vaspin decreases along with the increase in blood insulin and obesity (7). Researchers believe that increasing the secretion of this hormone causes weight loss and performance, as well as increasing insulin sensitivity, and can be used in people with type 2 diabetes or in prevention. The disease can be beneficial in people who are at risk of type 2 diabetes (6). Therefore, it is predicted that the upregulation of vaspin represents a compensatory mechanism against insulin resistance. In humans with normal glucose metabolism, it has been reported that serum vaspin has a significant negative relationship with body mass index (8). However, this difference caused by gender can be influenced by glycemic control or other factors. It will be necessary to conduct other studies in this field. Metabolic changes caused by this hormone have an important effect on fat tissue, muscle, liver and inflammation and are related to metabolic syndrome diseases. Therefore, it seems that one of the effective factors that affect the vaspin hormone is physical activity, which is a suitable strategy for the prevention and treatment of obesity and many diseases related to it, including cardiovascular diseases. Physical activity reduces deaths caused by obesity and cardiovascular diseases. Sports activity can be effective in different ways and there are various recommendations regarding effective sports activity (intensity, duration, type and number of sessions per week) to reduce fat tissue in healthy and sick people. Regular physical activities have various benefits. Among other things, it will lead to increased insulin sensitivity, blood sugar control, weight loss, reduction of body fat percentage, blood pressure reduction and reduction of cardiovascular disease (3).

On the other hand, research results show that at a high level of physical fitness, the activity of vaspin decreases, while sports activity in non-athletes increases the serum concentration of vaspin (9). Therefore, vaspin hormone has a direct relationship with insulin sensitivity, and by changing its level, the amount of glucose consumption can be changed through changes in insulin resistance or insulin sensitivity. In the research of Cheng et al., the effect of a 12-week program of aerobic



exercise on obese people was investigated, and also the research that Lee et al. conducted to determine the relationship between obesity and serum levels of vaspin on overweight boys and girls was observed. which, the serum levels of vaspin decrease (10-11). Kim S. et al. (2011) showed that twelve weeks of sports activity had no effect on vaspin levels (12) and Obridge et al. (2010) showed the reduction of vaspin by oxidative stress caused by activity (13).

Today, in addition to physical exercises, the attention of researchers has been focused on nutritional interventions, especially medicinal plants. One of these plants is zenian. (14) and contains 5% of essential oil (15). Although some studies have reported the yield of zenian seed oil to be more than 9% (16). Thymol is the main component of this essential oil (17). Research works conducted on women showed that this plant has anti-inflammatory, blood cholesterol lowering, antioxidant, antimicrobial, immune system strengthening and growth stimulating effects (18). In animal samples, it has been proven that the consumption of women Serum triglycerides have decreased LDL and increased HDL levels (19). For this reason, it seems that the use of this supplement is important in sports activities such as resistance training. Finding exercise and nutritional solutions for weight loss and effects on obesity.

Paying attention to the importance of the vaspin hormone in connection with various diseases and the contradictory results in various researches, very few researches have been done so far, and among the researchers, a definite result has not yet been obtained in relation to the function of the vaspin hormone, especially in relation to obesity. There are many ambiguities related to the function of this adipokine. Also, according to the issues mentioned above regarding the necessity of sports activity in improving the complications caused by inactivity and obesity as well as improving blood and tissue factors that are effective in obesity and insulin resistance, it seems that doing This research is necessary and the results of this research may be fruitful for all healthy people (to prevent diseases related to obesity) in the society and by providing an appropriate exercise program with the level of physical fitness, it will lead to a reduction in the number of deaths caused by related diseases. According to what has been said, the aim of this study is to find out the question of what effect does the combination of resistance training and herbal supplements have on the levels of vaspin and insulin resistance in inactive overweight women?

Methodology

In this study, inactive women of Tehran city, out of a population of 67 people, 32 were overweight (body mass index between 25 and 30 and fat percentage more than 35%) with a pre-test and post-test design randomly in 4 groups: 1: control, 2: resistance training, 3: resistance training + women, 4: women in the group.

Method of collecting information

First, in a meeting, the entire process of the research (physical activity and sampling) along with its goals and possible risks were explained to the subjects and their demographic information was obtained from them along with written voluntary consent. Also, a week before the start of the research, the maximum repetition of the maximum number of subjects was performed using the Berzyski method (20). The first blood sampling was taken at 8:00 am and in the state of 12 hours



fasting at night from all the subjects. After the completion of the project, 48 hours after the last training session, the blood samples of the subjects were taken in the post-test.

Blood sampling and measurement of variables

A blood sample of 6 cc was taken from the brachial vein of subjects in two groups. The collected samples were poured into sterile tubes containing K3EDTR. Heparin and EDTA tubes were placed in ice and then remained at room temperature for several minutes. Then, the serum was separated from the plasma by centrifugation for 10 minutes at 3500 RPM. All blood samples were frozen at -80°C and were used during laboratory tests. All sampling steps were done for each subject under the same conditions. The serum levels of vaspin were measured by ELISA method and Pars test kit. The level of insulin resistance was also measured using the Homa method (21).

$$\text{HOMA-IR} = [\text{fasting glucose (mmol/L)} \times \text{fasting insulin (mU/L)}] / 22.5$$

Resistance training program

The subjects of the resistance training group consisted of eight weeks and three sessions each week and the duration of each training session was one hour. The strength training program includes chest exercises, chest with dumbbells, front and back arms, barfix, underarm rowing, squats, front thighs and back thighs with a machine, standing leg back, shoulder with a barbell from the back and shoulder with a dumbbell, including the chest muscles. and the front of the upper arm and the back of the arm will be the legs and shoulders (22). The training program will be from four sets of 10-12 repetitions with 60% of a maximum repetition at the beginning of the course, to four sets with 10-12 repetitions with 70% of a maximum repetition And with one-minute breaks at the end of the training period, it will be reached (22).

Supplementation program with women

The Zinian supplement group will consume 7.5 mg/kg Zinian extract (thymol) made by Jihad University Medicinal Plants Research Institute daily with breakfast (23). Resistance training + placebo group also used 1 capsule containing 7.5 mg per kilogram of body weight of maltodextrin (placebo) daily. It should be noted that this study was conducted in a double-blind manner and none of the subjects or the researcher knew about the contents of the capsules they were using.

Statistical analysis

Descriptive statistics were used to describe the research results. The normality of the data distribution was checked using the Shapiro-Wilk test, and the statistical method of analysis of variance with repeated measures was used to check the comparison between groups. Also, the $P \leq 0.05$ level was checked using SPSS version 24 software.

Descriptive findings

The statistical description of the characteristics of the subjects (weight, BMI and age) is presented in table 1-3. The subjects were in the age range of 30-45 years. In the following, the description of the research variables is discussed in table 2-3.



Table 1.3. Description of the subjects' characteristics

BMI	height)cm(weight)kh(Age)year(groups/Index
±5.76 ^{27/04}	±10.71 ^{166/32}	±13.25 ^{65/82}	±4.23 ^{2/5}	control
±2.63 ^{26/09}	±12.11 ^{1170/18}	±16.42 ^{66/49}	±3.53 ^{3/06}	RT
±1.25 ^{26/10}	±17.24 ^{168/41}	±08.34 ^{68/42}	±2.83 ^{5/1}	RT+Sup
±2.21 ^{27/01}	±13.25 ^{169/51}	±13.27 ^{69/16}	±2.23 ^{7/3}	Sup

Table 3-2. The results of the Shapiro-Wilk test

P	S-K	Index
0.715	0.69	Vaspin
0.627	0.75	Insulin resistance

To check the significance of the difference in vaspin levels and insulin resistance in four groups (1: supplement, 2: supplement + intermittent exercise, 3: intermittent exercise, 4: control) at different times, from the analysis of variance with repeated measurements and Tukey's test was used in case of significance. The amount of intra-group, inter-group changes and group-time interaction, mean and standard deviation of Kamrin are summarized in Tables 3-3 to 6-3.

Table 3-3. Vaspin levels before and after the intervention in the 4 studied groups

G×T	P-value		Time		Groups	Index
	Group	Time	Post	Pre		
0.005	0.002	0.001	±1.08 ^{14/01}	±0.91 ^{13/70}	Control	vaspin)ml/ng(
			±1.12 ^{9/25}	±0.12 ^{13/77}	RT	
			±01.2 ^{09/08}	±0.1 ^{13/89}	RT+Sup	
			±0.44 ^{13/01}	±02.01 ^{13/33}	Sup	

The results showed that the effect of time was significant for Kamrin variable (p=0.001). In the examination of the changes within the group, it was observed that the levels of vaspin in the resistance training groups (p=0.001) and the interactive group (p=0.005) decreased significantly in the post-test compared to the pre-test, but there was a significant change in the control group. (p=0.628) did not exist. Also, in the supplement group alone (p=0.413) and the decrease group, but it was not statistically significant. It was also observed the group effect (p=0.002) and the time*group interaction effect (p= 0.005) is significant in the case of the Vaspin index, for a more detailed investigation using Tukey's post hoc test, it was observed that there is no significant difference between the effects of the training groups on the Vaspin index, but only in the resistance training group and the interactive group (p=0.001) a significant decrease in vaspin compared to the control group and the supplement group. Based on this hypothesis zero is rejected and hypothesis one is confirmed. Table 4.3. It shows the results of Tukey's post hoc test. You can also see the difference between groups in chart 1.3.



Table 4-3. Tukey's and Spin's follow-up test results

P	mean difference	Tuky post Hoc	Index
0.001	- 4.25	RT	vaspin
	- 4.81	RT+SUP)ng/ml(

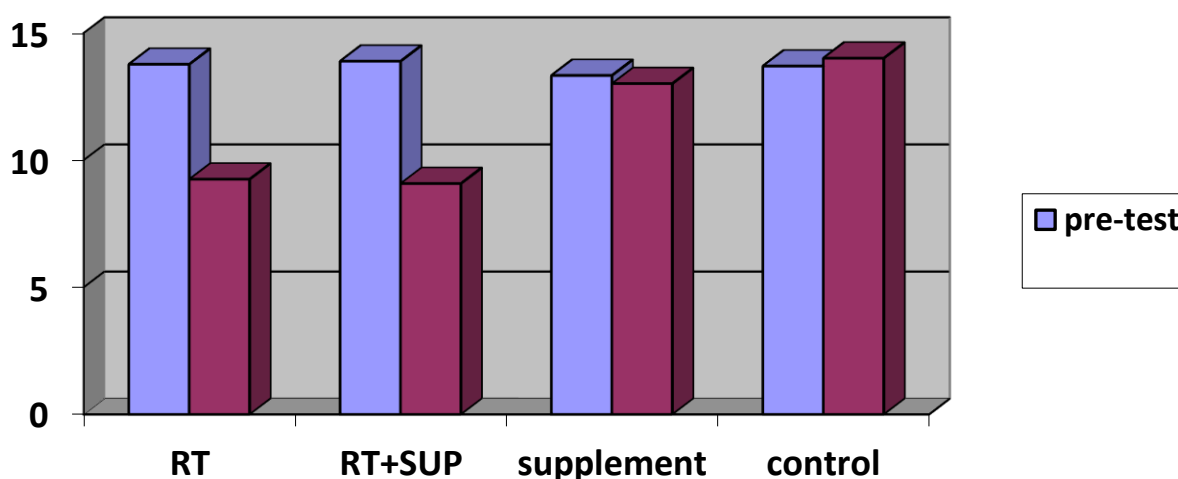


Diagram 1.3. Comparison of vaspin level in four groups in pre-test and post-test phase

Table 3-5. The level of insulin resistance before and after the intervention in the four studied groups

P-value		Time		Groups	Index
T×G	G	Post	Pre		
0.002	0.04	±12.218 ^{32/431}	±08.19 ^{31/03}	Control	Insulin resistance)HOMA-IR(
		±5.277 ^{24/51}	±3.24 ^{33/16}	RT	
		±4.07 ^{24/03}	±2.21 ^{32/108}	RT+SUP	
		±5.41 ^{31/206}	±8.302 ^{32/087}	SUP	

The results showed that the effect of time was significant for the insulin resistance variable (p=0.004). In the examination of changes within the group, it was observed that insulin resistance values in the training (p=0.05) and resistance training+supplement (p=0.05) groups were significantly reduced in the post-test compared to the pre-test, but there was a significant change in There was no control group (p=0.987). There was also a decrease in the supplement group alone, but it was not statistically significant (p=0.657). The group effect (p=0.05) and the time*group interaction effect (p =0.002) is significant in the case of insulin resistance index, for a more detailed investigation using Tukey's post hoc test, it was observed that there is no significant difference between the effect of exercise groups on insulin resistance index, but only two resistance exercise



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groups ($p=0.0001$) and resistance training+supplement ($p=0.0001$) had a significant decrease in insulin resistance compared to the control group and the supplement group. According to this hypothesis zero is rejected and hypothesis one is confirmed. Table 6.3. It shows the results of Tukey's post hoc test. You can also see the difference between groups in chart 2.4.

Table 6-3. Tukey's results regarding insulin resistance

P	mean difference	Tuky post Hoc	Index
0.001	- 7.8	SUP+RT	insulin resistance
0.001	- 8.65	RT)HOMA-IR(

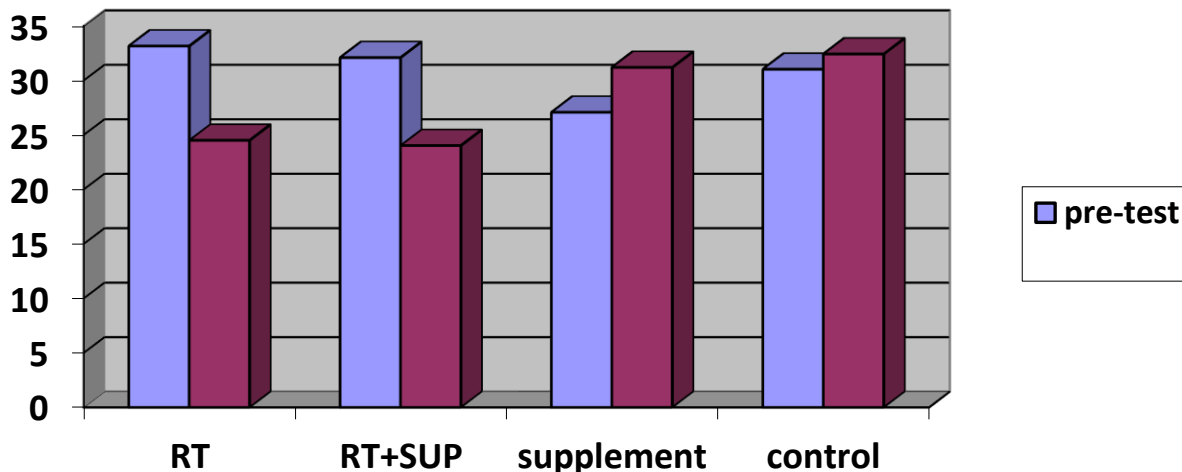


Figure 2.3. The difference in insulin resistance levels in the study groups in pre-test-post-test



Discussion

The aim of the research was the effect of 8 weeks of resistance training and supplements for women on vaspin and insulin resistance of inactive overweight women in Tehran. In dangerous metabolic situations such as obesity, type 2 diabetes and metabolic syndrome, increasing physical activity causes a decrease in fasting blood glucose and blood insulin levels, which indicates an increase in insulin sensitivity. Also, skeletal muscle tissue contributes the most to insulin resistance. the body has, and exercise training can improve the insulin sensitivity of the skeletal muscle and the whole body by improving glucose metabolism. Clinical studies show that the messenger of insulin and physical activity, phosphoinositide 3-kinase (PI3K) in the skeletal muscle of insulin-resistant people and type 2 diabetes is reduced, while the improvement of glucose absorption caused by whole body insulin after exercise in humans and mice is related to the increase of insulin receptor substrate 1 and 2 (IRS1-2) and PIK3 of skeletal muscle. Also, the upregulation of AMP-mediated protein kinase (AMPK) is another strong mechanism by which exercise training improves insulin sensitivity, so that due to exercise training, the expression of glucose transporter protein (GLUT4) and its transfer to the membrane Plasma in skeletal muscle increases through AMPK, and finally the entry of glucose into muscle cells and its use is facilitated (24). However, the purpose of our research is the effect of 8 weeks of resistance training and women's supplements on vaspin and resistance to Insulin inactive women were overweight in Tehran. In this study, it was seen that the levels of serum vaspin in two resistance training groups and the interactive group caused a decrease in serum vaspin in inactive girls, which is in line with the results of Salimi et al. (25), Hosseini et al. (26), Nizam Dost et al. (27), Sultani et al. (28), Malairi et al. (29), Riahi et al. (30), Lee et al. (33) was consistent. Yoon et al. reported that serum vaspin concentration in people with a high level of physical fitness is lower compared to people with a low level of physical fitness (32). Lee et al. showed that serum vaspin concentrations after seven days of adjustment Life style is reduced in obese children (30). Klotting et al showed that insulin sensitivity is actually an important and strong determinant of vaspin gene expression in fat tissue and high levels of vaspin in diabetic and obese people are actually a compensatory mechanism in The response is to decrease insulin sensitivity and decrease glucose metabolism, which attributed the decrease in vaspin levels to the increase in insulin sensitivity (31). Obracht et al. observed that serum vaspin levels decrease after four weeks of physical training and stated that the changes Vaspin is independent of insulin resistance and its changes are related to the conditions of oxidative stress caused by sports training (33). In a study, Soltani et al. (1401) investigated the effect of 12 weeks of endurance training and HIIT on the plasma levels of vaspin in obese male Wistar rats, who reported a significant decrease in the serum levels of vaspin (34). colleagues (35), Safarzadeh et al. (36). In a study, Akatash et al (2019) investigated the metabolic effects of HIIT exercise on PCOS patients and how it affects adiponectin, vaspin and leptin, which reported no significant change (35).

In the present study, it was seen that the levels of insulin resistance in the exercise and exercise+supplement groups had a significant decrease ($p < 0.05$), which is consistent with the results of research by Rezaian et al. (37), Noorzad et al. (38), Amozadeh et al.), Daryanosh et al.(40), Ansar et al.(41) and it was inconsistent with the results of Taabi et al.(42). Probably the reason for this inconsistency was the level and gender of the subjects and the type, intensity and duration of the exercise. Insulin resistance may be one of the effective factors in atherosclerosis,



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and it is also possible that it is directly caused by the effects of increasing serum insulin (43). In some studies, the relationship between cardiovascular diseases and their resistance Insulin and the increase of insulin and the special effect of intense sports activity on their reduction have been confirmed. For example Ebling et al. (1993) reported that exercise improves insulin resistance in the first session of exercise (44). Gelin et al. (2012) for 24 hours after an intense exercise session, blood sugar control in 7 people with type 2 diabetes. They examined 2. Repetitive exercise It was like this that every person in each session rode 10 times for 60 seconds with an intensity of 90% of the maximum heart rate. There were also 60 second rests between these sets. The results showed that one session of repetitive training Iodine improves the blood control of people suffering from type 2 diabetes (45 Kramer et al. (46), Ghanbari Niaki et al. (47) also reported an increase in insulin resistance after moderate to high intensity circuit resistance exercises. In another study conducted in 2010, the effect of a high intensity exercise session - Soulin was investigated in male students and its significance increase in insulin and insulin resistance. It was observed immediately after the exercise (48). Moussio et al. (49) and Winset et al. (50) also reported high insulin and glucose levels after a short-term anaerobic test.

Regarding the effectiveness of Zinian supplement on the factors of the present study, it should be stated that it is probably due to the effectiveness of thymol, which is the main composition of Zinian essential oil (17). The research works on Zinian showed that this plant has anti-inflammatory, reducing effects. blood cholesterol, antioxidant, antimicrobial, immune system booster and growth stimulant (18). In animal samples, it has been proven that women's consumption has reduced the serum concentration of triglycerides, LDL and increased HDL levels (19). It is probably through influencing the levels of low-density lipoproteins in the wake of weight loss due to the increase in the activity of the lipoprotein lipase enzyme. Again, more research is needed to prove these results.

According to the results of the present study, it can be said that resistance training has a significant effect on metabolic processes, and with the effect it has on the function of intracellular mediators, it can improve fat metabolism, and the result is an improvement in insulin resistance. Possible mechanism Also, according to the reduction of body weight in the subjects of the present study in the exercise groups and the interactive group, the reduction of fat percentage decreased the rate of adipogenesis, which is considered an important indicator for the pathogenesis of diabetic patients and overweight people, and more results are needed to confirm these findings. . Among the limitations of the present studies was the impossibility of directly evaluating the phenotype change by studying the type of adipocytes, as well as the impossibility of biopsy and evaluation of these blood factors within the adipocytes. Also, the impossibility of evaluating the plasma volume before and after Sports excellence is one of the other limitations of the present study. Considering the effect of inflammatory mediators such as IL-6, TNF, resistin, as well as the levels of LDL and HDL, it can be mentioned as important factors in examining the limitations of the research. Also, in relation to the effect of resistance training, this should be considered. that different stressors may be involved in the change of the insulin resistance index. From this, the importance of the regulatory role of irisin on the insulin resistance index and the lack of available data about the response of irisin to resistance exercise is revealed.



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