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THE EFFECTS OF AN AEROBIC TRAININGS PERIOD ACCOMPANY WITH MILK THISTLE (SILYMARIN) CONSUMPTION ON ADIPONECTIN AND TNF- α OF TYPE 2 DIABETES PATIENTS WITH HIGH BLOOD CHOLESTEROL

MARYAM GOVAHI¹, ZAHRA SHAMS², FARIBA BAKHTIARI^{2*}

1: Department of Physical Education, Islamic Azad University, Sciences and Researches Branch, Tehran, Iran

2: Department of Exercise Physiology, Islamic Azad University, Central Tehran Branch, Tehran, Iran

***Corresponding Author: E Mail: fariba1384@yahoo.com; Ph.: +98 9123086772**

ABSTRACT

The aim of the present study was investigation of effects of an aerobic trainings period accompany with milk thistle (silymarin) consumption on adiponectin and TNF- α of type II diabetes patients with high blood cholesterol.

Twenty-eight diabetes patients in the ages of 45 to 60 year old, who had blood cholesterol levels of 200 (mg/dl) to 300 (mg/dl) and blood glucose levels of 150 (mg/dl) to 200 (mg/dl), were purposefully and in access chosen. They divided to four groups of silymarin, aerobic trainings, silymarin + aerobic trainings and control (7 persons for each group). Interventions were done in duration of 12 weeks. Blood samples were taken from the four groups, before and after the interventions. Adiponectin and TNF- α were measured for each sample.

Adiponectin increased in groups of trainings and trainings + silymarin, significantly ($P=0.001$), but it did not have any change in the two other groups ($P>0.05$). TNF- α decreased in groups of trainings and trainings + silymarin, significantly ($P=0.001$), but it did not have any change in the two other groups ($P>0.05$). Addition of milk thistle (silymarin) consumption to aerobic trainings might not have any significant influence on adiponectin increment and TNF- α reduction among these patients, probably. However, further studies are required.

Key words: Silymarin, Aerobic Trainings, Adiponectin, TNF- α

INTRODUCTION

Silymarin is a medicinal herb with hepatic protection properties owing various compositions such as flavonoids with anti-oxidative properties, cellular membrane stabilization and glutathione increase, which its affirmative influence on recuperation of various deceases, like increment in blood cholesterol, have been reported in experimental studies [1,2,3,4,5].

This medicinal herb does not have any poisonous effect, and is prescribed for liverish patients in many countries, now [6,7]. Diabetes is a metabolic decease that is recognized through increment in blood glucose concentration due to deficiency of insulin excretion, insulin resistance or a combination of both these two [8]. This illness grows strikingly, all around the world, and its outbreak raising has become one of the paramount issues and problems of health, all around the world [9]. Adiponectin is a cytokine that is derivate on adipose tissue. This hormone has a substantial role in carbohydrate and lipid metabolisms regulations of liver and muscle tissues, and recognition of two adiponectin receivers (AdipoR1 and AdipoR2) in liver and muscle is just confirmation of this point. Connection of adiponectin to its receiver is the trigger of a complicated falls of signals transmission that

eventually lead to insulin sensitivity or activity improvement. Adiponectin serum level has negative relations to BMI, waist circumference [10], type 2 diabetes [11] and metabolic syndrome criteria [12,13], and has an affirmative relation to weight reduction [14]. Adipose tissue relates to metabolic syndrome disorders, atherosclerosis, blood pressure raising and Coronary artery decease (CAD), which is recognized through decrease in plasma level of adiponectin and insulin resistance [15]. Study results have indicated that adiponectin concentrations of blood circulation would increase, because of exercise [16].

In addition, exercise has shown its positive effect about inhibition of insulin resistance and preservation of natural level of insulin [16,17].

Elloumi et al (2009) observed two months schedule of aerobic trainings with moderate intensity would cause increment in adiponectin among obese adolescent boys [18]. TNF- α is an important inflammatory cytokine that has a substantial hand regulation of cellular processes [19]. Besides, it has a paramount role in production of IL-10 [19]. Previous studies have shown there is a relation between lipid mass and concentrations of inflammatory and anti-

inflammatory cytokines [20,21]. In such a way, Lira et al (2002) reported further muscle mass would engage during exercise. Therefore, levels of IL-6 and TNF- α would rise to increase fatty acid oxidation in cells. This issue might cause to reduce in fats of plasma [22,23,24].

De Rosa et al (2007) indicated TNF- α has a key role in regulation of regulatory T cells. Hence, increase in its serum concentration might reduce proliferation of regulatory T cells, in an obese person [25]. According to extensive effects of exercise on prevention and treatment of obesity and its side-effects immunity, it is assumed that these effects might probably relate to regulation of adipose tissue [26]. In the other hand, some studies indicated the excessive increment of fat could hazard immunity. For example, research of Rudin and Barzilai showed increment in amounts of TNF- α among obese people, in both natural and experimental conditions [27]. Recently, consumption of additives has been suggested to aid homeostase balance. In this way and regarding the above-mentioned issues, the purpose of the present study was investigation of effects of an aerobic trainings period accompany with milk thistle (silymarin) consumption on adiponectin and TNF- α of type 2 diabetes patients with high blood cholestrol.

SUBJECTS AND METHODS

Twenty-eight diabetes patients in the ages of 45 to 60 year old, who had blood cholesterol levels of 200 (mg/dl) to 300 (mg/dl) and blood glucose levels of 150 (mg/dl) to 200 (mg/dl), were purposefully and in access chosen. They divided to four groups of silymarin, aerobic trainings, silymarin + aerobic trainings and control (7 persons for each group).

The patients are adequately informed about silymarin medicinal herb properties, probable side effects, and method and duration of the experiment. The patients of silymarin and silymarin + trainings groups received daily-prescribed three 200gr silymarin pills, during 12 weeks, after entrance to the study. Besides, the trainings and silymarin + trainings groups participated in 12 weeks aerobic trainings on treadmill. The 12 weeks trainings schedule is assigned from easy to hard exercises and also from low intensity to high intensity ones, with consideration of the overload principle and increment in exercise intensity.

The trainings schedules of aerobic and silymarin + aerobic groups consisted of running with exercise intensity of 35-45% target heart rate (THR) (Karvonen method) in span of 16 min, for the first week, which was increased to 60% THR in span of 30, for the 12th week. In addition, exercises intensities

controls were carried out through determination of subjects' heart rates, before, during and after each exercise session, by using Pollard stethoscope. The aerobic trainings + silymarin group received both interventions of aerobic trainings and silymarin medicinal herb consumption. The control group did not receive any intervention and performed their usual daily activities during the experiment. Blood samples were taken from the four groups, at both 24 hr before the interventions and 48 hr after those. Adiponectin and TNF- α were measured for each sample. Adiponectin was gauged by utilizing experimental kit and implementing Eliza method. TNF- α was measured by using Diaclone kit (made in France). Factor ANOVA with repeated measures at

significance level of $P \leq 0.05$ was applied to investigate variation of variables in the four groups.

RESULTS

Before and after the interventions concerning mean and standard deviation results of the subjects of the four groups were presented in table 1. In addition, results of factor ANOVA with repeated measures and Tukey's post hoc test were given in tables 2 and 3, respectively. Adiponectin increased significantly, in groups of trainings and trainings + silymarin ($P=0.001$), but it did not have any significant change in the two other groups. TNF- α decreased significantly, in groups of trainings and trainings + silymarin ($P=0.001$), but it did not have any significant change in the two other groups.

Table 1: Statistical descriptions of the variables (mean \pm standard deviation)

Variables	Groups	Before Training	After Training
Adiponectin	Silybum marianum	5.28 \pm 1.38	5.42 \pm 1.13
	Aerobic Training	6 \pm 1.91	10.14 \pm 1.95
	Silybum marianum + Aerobic Training	5.57 \pm 1.51	9.28 \pm 1.38
	Control	5 \pm 1.15	5.14 \pm 1.67
TNF- α	Silybum marianum	95.14 \pm 3.67	94.57 \pm 3.59
	Aerobic Training	95.57 \pm 4.50	89.28 \pm 3.63
	Silybum marianum + Aerobic Training	94.57 \pm 4.42	89 \pm 4.76
	Control	94.28 \pm 4.71	94.57 \pm 4.46

Table 2: Statistical results of factorial ANOVA with repeated measures to compare variations of the variables in the groups

Variables	Factor	F	P
Adiponectin	Time	154.71	0.001*
	Group	7.12	0.001*
	Time \times Group	44.87	0.001*
TNF- α	Time	139.83	0.001*
	Group	0.89	0.45
	Time \times Group	43.11	0.001*

* The mean difference is significant at the 0.05 level

Table 3: results of Tukey's post hoc to determine origin of difference

Pair to pair comparison	Adiponectin	TNF- α
Silybum marianum - Aerobic Training	0.001 *	0.001 *
Silybum marianum - Silybum marianum + Aerobic Training	0.001 *	0.001 *
Silybum marianum - Control	1	0.64
Aerobic Training - Silybum marianum + Aerobic Training	0.79	0.76
Aerobic Training - Control	0.001 *	0.001 *
- Silybum marianum + Aerobic Training - Control	0.001 *	0.001 *

* The mean difference is significant at the 0.05 level

DISCUSSION

According to the results of the present study, a period of aerobic trainings would cause significant increment in adiponectin among type 2 diabetes patients with high blood cholesterol. However, adding milk thistle (silymarin) consumption did not show any significant difference. It seems, exercise intervention is the only factor that has affect this process. Different types of exercises with different spans and intensities have been applied in various studies. Meanwhile, the surveys have indicated that the shortest period of trainings accompany with diet that could affect on the amount of adiponectin serum is two weeks [28]. Research results have shown amount of engaged muscle and exercise type are other influencing parameters in response of adiponectin serum, besides duration of activity [28,29].

Berg et al (2001) showed adiponectin-therapy in rats decreases amounts of muscular triglyceride and hepatic gluconeogenes and commented that adiponectin is a connector message between muscle and adipose tissues

[30]. Upon the recent issue, adiponectin increases fatty acid oxidation in muscular cells through activation of direct AMP-activated protein kinase (AMPK) [30].

Tomas (2004) showed activity of this enzyme relates to exercise-engages muscle mass [31]. Therefore, there is a hypothesis that propounds the athletes who implement further muscle mass, need more adiponectin to regulate metabolic flow [30,31]. There are evidences that indicate adiponectin causes increment in insulin sensitivity through activation of AMPK [31]. It appears, adiponectin increases insulin sensitivity due to its direct effect on hepatic glucose production and its effect on increment in oxidation of liver lipid that leads to reduce lipid storages [31,32].

Adiponectin can prevent glucose production of liver and therefore amplify the effect of insulin, through negative regulation of the key enzymes of gluconeogenes process such as phosphoenolpyruvate (PEP) and glucose 6-phosphate [32]. Besides, based on the results of present study, an aerobic trainings period

would lead to significant decrease in TNF- α among type 2 diabetes patients with high blood cholesterol. Nevertheless, adding milk thistle (silymarin) did not appear any significant difference. In agreement with the present results, Pervaiz and Hoffman-Goetz (2012) observed decrease in amount of TNF- α following treadmill high intensity exercises, among female rats [33].

Mechanisms of cytokines excretions in response to exercise are very complicated and have not been known well, yet. It has been recently clarified that muscular damages and their resulting inflammations might cause collision between crushed proteins fragments of damaged muscles and fibroblasts and white blood cells, and thereafter release of cytokines [34]. Besides, it might produce and play by a special tissue, locally [25]. Some investigations indicated excretions of cytokines relate to release of stress hormones. In such a way, increment in the body temperature increases release of stress hormones, during exercise [35]. Nevertheless, stress hormones were not measured in the present study, but it has been indicated that exercise can affect relation levels of cortisol, catecholamines and carbohydrates storages, which lead to change in TNF- α , in turn [37].

CONCLUSION

It appears twelve weeks aerobic trainings, accompany with increment in adiponectin and decrease in TNF- α , would lead to desirable changes in the body weight, adipose tissue, blood glucose and insulin resistance among type 2 diabetes patients with high blood cholesterol. Nevertheless, it is preferred to measure blood glucose, insulin resistance, blood lipids and other variables, too. However, adding milk thistle (silymarin) to aerobic trainings might not have any influence on increment in adiponectin and decrease in TNF- α , among those patients. By the way, further investigations are required.

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