http://jrhc.miau.ac.ir

Report of Health Care **Original Article**

Volume 5, Issue 4, 2019, p. 1- 7

Effect of Aerobic Training with Ginger Supplement on Plasma Levels of Visfatin and Lipid Profile in Middle-aged Obese Men

Mehri Gholipoor [1*], Mohammad Karimi [1], Saeed Keshavarz [2]

1. Department of Physical Education and Sport Sciences, Qom University of Technology, Qom, Iran
2. Sport Medicine Research Center, Najafabad Branch, Islamic Azad University, Najafabad, Iran

Received: 18 June 2019

Accepted: 22 November 2019

Published online: 22December 2019

***Corresponding author:**
Mehri Gholipoor. Department of Physical Education and Sport Sciences, Qom University of Technology, Qom, Iran

Phone: +989155064755
Fax: +982536641604
Email: gholipoor4755@gmail.com

Competing interests: The authors declare that no competing interests exist.
Citation: Gholipoor M, Karimi M, Keshavarz S. Effect of aerobic training with ginger supplement on plasma levels of visfatin and lipid profile in middle-aged obese men. Rep Health Care. 2019; 5 (4): 1- 7.

Abstract

Introduction: The aim of this research was to study the effect of eight weeks of aerobic training with ginger supplementation on plasma visfatin and lipid profile in obese men.

Methods: Forty volunteer middle-aged obese men were divided randomly into four equal groups (n=10) including; placebo, ginger supplement, aerobic training and aerobic training with ginger supplement. Aerobic training consisted of eight weeks, three sessions per week and intensity of 55-65 percentage of maximum heart rate. Ginger supplementation consisted of 3 gr ginger consumption as capsule, three times before each meal for eight weeks. Changes of plasma levels of visfatin and lipid profile were assayed before and after eight weeks. Data were analyzed using one-way ANOVA test and Tucky's post-hoc comparison ($p<0.05$).

Results: There was significant difference between groups in plasma levels of visfatin ($p=0.03$), VLDL ($p=0.01$) and TG ($p=0.03$). The observed difference was related to placebo and aerobic training with ginger supplement groups.

Conclusion: It seems that eight weeks of aerobic training with ginger supplementation may improve some cardiovascular risk factors in middle-agesd obese men.

Keywords: Aerobic Training, Obesity, Ginger, Visfatin

Introduction

Various studies have been done on fat tissue and its functional relationship with obesity and overweight prevalence, and related pathologic conditions (1, 2). Nowadays, white fat tissue is considered as a multi-functional organ. This tissue, in addition to its main function (storing fat), has endocrine function, such that it releases various hormones (leptin, adiponectin, visfatin, and wide range of other protein agents) which are called adipocytokines or adipokines.One of these adipocytokines is visfatin. Visfatin is one of the adipokines that is releasesd mostly by visceral fat tissue and its gene expression and plasma levels are decreased in obese people. Metabolic effects of Visfatin occur mainly through connection and activation of insulin receivers (3). Research reveal that increase in visfatin increases insulin sensitivity, and the results of previous research show that plasma concentration of visfatin decreases in people with stomach obesity or diabetes. On the other hand, it was found that serum concentration of visfatin is affected by glucose concentration and this influence is changed by some drugs (4). In fact, serum level of visfatin has direct relationship with body fat rate. There are growing evidences that extracellular visfatin can lead to endothelial dysfunction through a series of harmful actions on the vascular wall (5). Human studies indicated that visfatin can directly promote inflammation via the activation of the extracellular-signal regulated kinase (ERK) 1/2 - nuclear factor (NF)-κB - inducible nitric oxide synthase (iNOS) axis

(6). Some investigations have reported different effects and correlations between visfatin and various medical conditions such as inflammation, atherosclerosis, metabolic syndrome and hepatic fat disease (7). Various factors affect the reduction of body fat (for example nutrition, environment and exercise).Various studies have been conducted on the effect of exercise on visfatin which have inconsistent results. For example, Frydeland-Larsen *et al.* showed that exercise increases visfatin of mRNA (8). QanbariNiaki *et al.* reported that eight weeks of endurance exercise decreases visfatin (9). MohamadiDamieh *et al.* stated that eight weeks of resistance and endurance exercise decreases body fat and visfatin (3). Haider *et al.* showed that visfatin is high in patients with type I Diabetes and decreases significantly after four months of aerobic exercise (10). EtemadiBrojeni *et al.* reported that 12 weeks of intensive aerobic activity decreases weight, body mass index, fat mass and fat rate significantly (11). Some studies showed that using ginger moderates fat metabolism through inhibiting biosynthesis (biologic synthesis) of cellular cholesterol, increasing biosynthesis of bile acid for removing cholesterol from body, and increasing cholesterol remove through feces (12). American Association for Medical Herbal Productions ranks fresh root of ginger first and dried root of ginger second in terms of safety and health (13). Exercise and bodily activity have been considered in the last few decades as the basis of managing obesity, diabetes, and other metabolic chronic diseases along with drug and diet. Increased bodily activity can decrease occurrence of metabolic syndrome and type II diabetes. Moreover, changes in life style such as regular bodily activity with or without consuming medicine and changes in diet have been proved to affect type II diabetes. Benefits of exercise include blood glucose control, insulin sensitivity, decreased body fat (especially visceral fat), improved control of blood pressure and blood fat mixture, and decreased chronic inflammation (14). On the other hand, research on the effect of herbal supplements on factors affecting metabolic diseases like metabolic syndrome and cardio-vascular diseases have gained researchers interest in the last few years. Most studies conducted in this regard examine the role of different exercises on the risk factors of cardiovascular diseases and the role of exercise especially aerobic exercise along with using ginger supplement has been rarely studied. Current research seeks to examine the effect of eight weeks of aerobic training with medium intensity on plasma levels of visfatin and lipid profile in obese men.

Methods

In the present semi-experimental double blind study with pre-test post-test design, 40 volunteer middle-aged obese and inactive men in Mashhad city with body mass index (BMI) equal to or higher than 30 kg/m^2 and age range of 30-40 were selected as subjects in systematic (targeted) and available modes. All subjects were asked to give written consent forms after holding a session to give information about research objectives and steps of conducting research. Subject had to have no regular exercise in the past year. Health of subjects was assessed by a physician in terms of cardiovascular system, skeletal system and muscular system. Subjects didn't have special diet and also didn't use supplements. Then, a body composition device (Inbody 270, made in Korea) with electrical resistance and conductivity was used in order to assess body weight, BMI and body fat rate of subjects. Body weight was determined with error less than 0.1 kg and body fat rate was obtained. BMI was calculated by dividing body weight (kg) by squared height (m). Subjects were randomly grouped in the placebo (Rice flour), ginger supplement, aerobic exercise and aerobic exercise with ginger supplement in equal groups. Aerobic exercise included eight weeks of exercise, three sessions in week and intensity of 55-60 % of maximum heart rate (MHR) (MHR=220-age). Each session was 30 minutes which

included warm up by walking around gym, bending and stretching and then eight minutes running with 55 % of maximum heart rate in the first session and 10 minutes for cooling down at final part. Every two sessions, one minute was added to running and it reached 20 minutes in the end of the eighth session. Exercise intensity began from 55% of maximum heart rate in week one and every three weeks, five percent was added to the intensity. Ginger supplementation included using 3g in capsule form in three meals (1g each meal) for 8 weeks. Placebo group didn't exercise and didn't use supplement. They used starch as placebo. To control the diet of subjects, they were asked to record the amount and number of meals and type of food in a food reminder questionnaire three days before bleeding and use the same diet in post-test for secondary bleeding. Blood samples were taken 24 hours before and after exercise at 10hr fasting state. Plasma levels of visfatin were assessed by using DRG kit made in Germany (sensitivity 1.5ng/ml) by EISA method. Lipid profile was measured by enzyme-chronometry method using Pars Azmoun Commercial Kits (Tehran, Iran) and spectrophotometer (Pharmacia Ultra spec 3000). Data were analyzed by one-way analysis of variance at $p< 0.05$ level, using SPSS software (version 22).

Results

The mean and standard deviation of demographic characteristics were measured in the pre-test and post-test and are presented in table 1. As it can be seen in Table 2, there is a significant difference among groups at post-test step in terms of visfatin, VLDL, and TG value. Tukey's post-hoc test shows that the difference observed in visfatin value is related to the placebo and the aerobic + supplement groups ($p=0.04$) and the difference observed in VLDL and TG value is related to the placebo and the aerobic groups ($p=0.1$ and $p=0.04$ respectively).

Discussion

Findings showed that eight weeks of aerobic exercise decreases plasma level of visfatin in middle-aged obese men. Moreover, ginger supplement along with aerobic exercise can decrease visfatin level significantly. Findings of current research are consistent with Haider *et al.* (2006) research (10). In this research, changes in visfatin concentration were examined in patients with type II diabetes after two and four months of aerobic exercise. The findings showed that aerobic exercise decreases visfatin significantly. In addition, they concluded that high concentration of visfatin in patients with diabetes can be decreased by regular exercise. However, it is not clear that whether glucose tolerance is affected by changes in visfatin concentration. Mohamadi Damieh *et al.* (2009) reported decrease in plasma visfatin in middle-aged men after a period of endurance and resistance exercise (3). These researchers concluded that eight weeks of endurance and resistance exercise decreases plasma visfatin concentration in middle-aged through decreasing fat mass. Ravasi *et al.* (2006) showed that 13 weeks of endurance exercise decreases pre-inflammatory cytokines in obese men and this can be accompanied with decreased insulin in circulation and improved resistance to insulin (15). Mahloji *et al.* (2013) showed positive anti-inflammatory effect of using ginger in patients with type II diabetes after eight weeks of use after lunch and dinner (16). Visfatin is one of the adipokines which is released mostly by visceral fat tissue and its gene expression and plasma levels decrease in obese people. Metabolic effects of visfatin occur mainly by connection and activation of insulin receivers (3). Conducted research reveal that increasing visfatin increases insulin sensitivity and results of previous studies show that plasma concentration of visfatin decreases in people with stomach obesity or diabetes. Various stimulating factors have been recognized in relation to visfatin which include height (10, 17), obesity (18),

Table1. Basic Characteristics of Subjects (Data M±SD)

Group Variable	Placebo	Supplement	Exercise	Supplement + Exercise
Age (years)	33.3±3.1	35.4±2.8	34.6±3.8	34.6±3.7
Height (cm)	173.7±5.2	175.3±5.1	171.7±4.9	175.7±5.2
Weight (kg)	90.4±4.6	91.7±7.3	86.8±7.7	93.9±8.6
BMI (kg/m^2)	33.1±1.9	32.8±1.6	32.4±1.8	33.4±1.9
Body Fat %	Pretest: 37.3±2.3 Posttest: 36.1±2.2	39.1±2.9 38.2±2.3	37.5±3.1 34.4±2.7	38.4±2.7 34.4±2.7

Table2. *Results of one-way ANOVA of measured variables in the post-test phase*

Group Variable		Placebo	Supplement	Aerobic	Aerobic + supplement	F	P
Visfatin (ng/ml)	Pretest Post-test	8.03±2.17 8.01±2.29	6.55±1.39 6.09±1.40	7.38±1.89 7.00±1.64	7.01±1.77 5.80±1.63	3.163	0.036*
HDL (mg/dl)	Pretest Post-test	46.7±5.70 45.6±3.90	51.3±6.80 52.2±7.10	49.7±9.10 53.0±8.50	47.8±5.70 51.8±4.90	2.818	0.53
LDL (mg/dl)	Pretest Post-test	118.4±23.50 123.6±20.90	123.7±25.20 120.0±21.10	116.5±24.50 107.7±19.70	113.3±19.70 106.6±16.10	1.928	0.142
VLDL (mg/dl)	Pretest Post-test	31.7±5.30 32.2±4.10	33.3±6.10 31.2±5.60	30.6±7.20 24.4±4.80	34.0±6.60 29.4±7.20	3.861	0.017*
TG (mg/dl)	Pretest Post-test	109.0±9.80 112.0±12.70	111.3±13.10 110.8±14.30	104.5±10.20 98.3±9.40	107.7±9.80 102.1±10	3.18	0.035*

*Significant at $p<0.05$

and hyperglycemia (19) and severe infection (20). Each of these factors has certain mechanisms for stimulating visfatin release which only are mentioned here to show importance of visfatin in the body and necessity of doing further research. In addition to stimulating factors of visfatin release which were mentioned, other factors such as IL-6, TNF-α, growth hormone (21), somatostatin and free fatty acids (10), limit or decrease visfatin release. In general, it seems that visfatin originated from fat tissue and macrophages possibly plays an important role in pre-inflammatory processes and regulation of immunity processes (22) and aerobic exercise with medium intensity along with using supplement decreases plasma values of visfatin. Findings of the current research showed that eight weeks of aerobic exercise increases HDL and decreases LDL, VLDL and TG significantly. In the ginger supplement group, only VLDL values showed a significant decrease and in the aerobic training with ginger supplement group, a significant increase in HDL and a significant decrease in LDL, VLDL and TG were observed. Consistent with findings of the current research, Alizadeh *et al.* (2008) observed a significant decrease in triglyceride, LDL, and VLDL concentrations after ginger supplement intervention in a 45-day period. Average

change in cholesterol and triglyceride levels in the ginger group was significantly higher than the control group. Average decrease in LDL levels and increase in HDL values was higher in the ginger group than the placebo group. They concluded that ginger supplement has significant decreasing effect on blood fats (23). Moreover, it became clear in Atarzade Hosseini and Rahimian (2012) study that six weeks of aerobic exercise along with low-calorie diet results in good effects on body composition, lipid profile and improved metabolic syndrome indices in obese women (24). In contrast, findings of the current research are not consistent with Marcus *et al.* (2009) study. They reported lack of significant changes in fat profile of elderly women after exercise intervention. Perhaps the reason of this inconsistency is related to age and gender of subjects. Moreover, subjects in this study had two sessions of exercise in a week and probably the number of exercise sessions was not sufficient to make significant changes in lipid profile (25). Asgari *et al.* (2014) research also showed different results from current research. They studied the effect of endurance and combined exercises on some of adipokines, growth hormone and lipid profile in overweight girls and found that cholesterol and triglyceride levels only decreased in the combined exercises group and aerobic exercise didn't have a significant effect on these indices (26). Probably, aerobic exercises with ginger supplementation had more effects on lipid profile of obese men. Oxidation of free fatty acids in long term exercises with medium intensity which are done with 50% of oxygen consumption may comprise 90% of oxidative metabolism. Various reasons have been stated for fat oxidation in obese people. For example, decreased activity of lipoprotein lipase of skeletal muscle can be pointed. Programs that increase skeletal muscle capacity for using fats (aerobic exercises), may have an important role in controlling weight of obese people and decreasing cardio-vascular risk factors. The most prevalent lipid disorders in obese people include increased TG and decreased HDL. The last parameter is among risk factors of cardiovascular diseases. While increased TG is accompanied with increase in LDL particles which are is known as atherogenic factor, dyslipidemia is accompanied with increased body fat, especially visceral fat. There is reliable evidence that aerobic exercises have positive significant effects on plasma lipid levels. General view on the research conducted on the effect of aerobic exercise on lipid profile shows that exercise hardly affects TC and LDL levels, unless being accompanied with diet and weight loss (27). More significant decrease in triglyceride in current research can be attributed to lipoprotein lipase (LPL) response to exercise. Lipoprotein lipase is among enzymes that regulate lipoproteins and degrade triglyceride contained in lipoproteins enriched with triglyceride. Studies show that liver lipase decreases and is controlled after regular exercise. Therefore, production of triglyceride contained in VLDL and LDL decreases. It seems that duration of exercise decreases triglyceride (28).

Conclusion

In general, it is concluded that aerobic training can have beneficial effects on visfatin levels which is a risk factor for endothelial dysfunction and immune system. Formation of inflammatory conditions in the body can have harmful effects. Various solutions like doing aerobic exercise with medium intensity as a prevention method and/or using supplements like ginger can be useful in improving bad conditions in obese people. It seems that a combination of aerobic exercise with using ginger supplement is a suitable solution for obese people and confronting different outcomes of obesity. However, achieving appropriate solutions for overcoming these harmful effects requires doing further and more precise studies.

Ethical issues

No applicable.

Authors' contributions

All authors equally contributed to the writing and revision of this paper.

Acknowledgments

The authors thank and appreciate all the participants in this research.

References:

1. Sorani M, Jalali Dehkordi KH, Jalali Dehkordi A. Effect of 12 weeks aerobic training with ginger consumption on IL-18 and CRP in obese men. Rep Health Care. 2016; 2 (4): 1- 9.
2. Karbaschian Z, Hosseinzadeh-Attar MJ, Giahi L, Golpaie A, Masoudkabir F, Talebpour M, et al. Portal and systemic levels of visfatin in morbidly obese subjects undergoing bariatric surgery.Endocrine J. 2013; 44 (1): 114- 118.
3. Mohammadi Damieh A, Khajelandi A, Rostami A, Asadi E. The effects of eight weeks of resistance versus endurance training on plasma visfatin level in middle- aged men. Armaghane danesh J. 2010; 15 (3): 233- 242.
4. Hossein Nejad A, Mirzaei K, Hosseinzadeh MJ, Jafari N, Najm Afshar A, Rahmani M, et al. The effect of visofatin genotype on the need for oral glucose control drugs in patients with typeII diabetes. Iranian J Diabetes Metab. 2009; 8 (3): 227- 236.
5. Romacho T, Villalobos LA, Cercas E, Carraro R, S□nchez-Ferrer CF. Visfatin as a novel mediator released by inflamed human endothelial cells. PLoS One. 2013; 8 (10): e78283.
6. Romacho T, Azcutia V, V□zquez-Bella M, Matesanz N, Cercas E. Extracellular PBEF/NAMPT/visfatin activates pro-inflammatory signalling in human vascular smooth muscle cells through nicotinamide phosphoribosyltransferase activity. Diabetologia. 2009; 52: 2455- 2463.
7. Saddi-Rosa P, Oliveira CSV, Giuffrida FMA, Reis AF. Visfatin, glucose metabolism and vascular disease: a review of evidence. Diabetol Metab Synd. 2010; 2 (21): 1- 6.
8. Frydeland-Larson L. Visfatin mRNA expression in human subcutaneous adipose tissue is regulated by exercise. AM J Physiol Endocrinol Metab. 2006; 292: 24- 31.
9. Ghanbari Niaki A, Fathi R, Shahandeh F, Yazdani M, Hajizadeh A. The effect of endurance training and Pistacia atlantica (bene) extraction on resting plasma visfatin and lipids levels in female rats. Daneshvar Med J. 2011; 94 (1): 1- 11.
10. Haider DG, Mittermayer F, Schaller G, Artwohl M, Baumgartner-Parzer SM, Gerhard Prager G. Free fatty acids normalize a rosiglitazone-induced visfatin release. Am J Physiol Endocrinol Metab. 2006; 291 (5): 885- 890.
11. Eatemady-Boroujeni A, Kargarfard M, Mojtahedi H, Rouzbehani R, Dastbarhagh H. Comparison of the effects of 8- weeks aerobic training and resistance training on lipid profile in patients with diabetes type 2. J Isfahan Med Sch. 2014; 32 (282): 524- 533.
12. Matsuda A, Wang Z, Takahashi S, Tokuda T, Miura N, Hasegawa J. Upregulation of mRNA of retinoid binding protein and fatty acid binding protein by cholesterol enriched-diet and effect of ginger on lipid metabolism. Life Sci. 2009; 19 (84): 903- 907.
13. Pongrojpaw D, Somprasit C, Chanthasenanont A. A randomized comparison of ginger and dimenhydrinate in the treatment of nausea and vomiting in pregnancy.J Med Assoc Thai. 2007; 90 (9): 1703- 1709.
14. Eizadi M, Karimy M, Kohandel M, Doaly H. Effect of aerobic exercise on serum leptin response and insulin resistance of

patients with type 2 diabetes. J Qazvin Univ Med Sci. 2013; 16 (4): 33- 39.
15. Rawasi AA, Aminian Razavi T, Gaieni AA, Hamedinia MR, Haghighi AH. The effect of endurance training on pro-inflammatory cytokines and insulin resistance in obese men. Movement. 2006; 28 (1): 31- 49.
16. Mahluji S, Ostadrahimi A, Mobasseri M, Ebrahimzade Attari V, Payahoo L. Anti-inflammatory effects of Zingiber officinale in type 2 diabetic patients. Adv Pharm Bull. 2013; 3 (2): 273- 276.
17. Jurimae J, Ramson R, Maestu J, Purge P, Jurimae T, Arciero PJ et al. Plasma visfatin and ghrelin response to prolonged sculling in competitive male rowers. Med Sci Sports Exer. 2009; 41: 137- 143.
18. Jia SH, Li Y, Parodo J, Kapus A, Fan L, Rotstein OD et al. Preت B cell colonyت enhancing factor inhibits neutrophil apoptosis in experimental inflammation and clinical sepsis. J Clin Invest. 2004; 113 (9): 1318ت 1327.
19. Dogru T, Sonmez A, Tasci I, Bozoglu E. Plasma visfatin levels in patients with newly diagnosed and untreated type 2 diabetes mellitus and impaired glucose tolerance. Diabetes Res Clin Pract. 2007; 76 (1): 24- 29.
20. Kendal CE, Bryant-Greenwood GD. Pre-B-cell colony-enhancing factor (PBEF/Visfatin) gene expression is modulated by NF-**κ**B and AP-1 in human amniotic epithelial cells. Placenta. 2007; 28 (4): 305- 314.
21. Kralisch S, Klein J, Lossner U, Bluher M, Paschke R, Stumvoll M. Hormonal regulation of the novel adipocytokine visfatin in 3T3-L1 adipocytes. J Endocrinol. 2005; 1: 185- 193.
22. Aiping L, Wenhe C, Kelly H. Effects of visfatin gene polymorphism RS4730153 on exercise-induced weight loss of obese children and adolescents of han chinese. Int J Biol. 2013; 9 (1): 16- 21.
23. Alizadeh-Navaei R, Roozbeh F, Saravi M, Pouramir M, Jalali F, Moghadamnia AA. Investigation of the effect of ginger on the lipid levels. A double blind controlled clinical trial. Saudi Med J. 2008; 29 (9): 1280- 1284.
24. Attarzadeh Hoseini SR, Rahimiyan Mashhad Z. Comparison the effect of aerobic training and diet on Body Composition and Metabolic Syndrome Indexes in overweight and obese women. Int Shomal Sports Sci Conf. 2012.
25. Marques E, Carvalho J, Soares JMC, Marques F Mota J. Effects of resistance and multicomponent exercise on lipid profiles of older women. Maturitas. 2009; 63: 84- 88.
26. Askari R, Ravasi AA, Gaeini AA, Hedayati M, Hamedinia MR. The effect of combined exercise training on some adipokines and insulin sensitivity index in overweight females. J Sport Biomotor Sci. 2012; 5 (1): 25- 37.
27. Kraus WE, Houmard JA, Duscha BD, Knetzger KJ, Wharton MB, McCartney JS, et al. Effects of the amount and intensity of exercise on plasma lipoproteins. New England J Med. 2002; 347 (19): 1483- 1492.
28. Saremi A, Shavandi N, Bayat N. The effect of aerobic training on ghrelin and leptin serum levels and sleep quality in obese and overweight men. Arak Med Univ J. 2012; 15 (60): 52- 60.