KenKyu

Diabetes, Obesity & Metabolic Disorders Open Access 2:23-26 (2016)

Research Article

# The effect of resveratrol supplementation on malondialdehyde, TNFα and interlukine-2 in elite female volleyball players

**Leila Darvishi[1], Reza ghiasvand[1], Zahra Maghsoudi[1]***

Food Security Research Center and Department of Community Nutrition, School of Nutrition and Food Sciences, Isfahan University of Medical Sciences, Isfahan, Iran

**Received** February12, 2016; **Accepted** March 25, 2016; **Published** March 29, 2016



## Abstract

**Introduction:** Polyphenol and resveratrol sources as anti-inflammatory and antioxidant nutrient can be effective in lowering pro-inflammatory cytokines and their related-irreversible disorders. In this study, we assessed the role of this supplement on plasma tumor necrosis factor-α (TNF-α), malondialdehyde (MDA) and interleukin 2 (IL-2) concentration in female professional volleyball players. Controversy in previous findings cause that more study was performed to assess the effect of resveratrol supplementation on malondialdehyde, TNFα and interlukine-2 in elite female volleyball players

**Methods:** Twenty four professional volleyball players were randomized entered into intervention and placebo groups. They received 40 mg of resveratrol supplements or placebo pills for 11 weeks. Fasting blood TNF-α, MDA and IL-2 were measured at baseline and after the intervention period. Data were analyzed using paired t-test for within group study comparison and independent sample t-test was done to assess between groups comparison . Analyses were performed using SPSS software (version 20; SPSS, Inc., Chicago, IL, USA).

**Results:** There was a statistically significant decrease in plasma TNF- α and IL-2 concentrations after intervention; while MDA levels showed no significant change. There was a non-significant difference between two intervention groups.

**Conclusions:** Resveratrol supplementation cannot reduce TNF- α, IL-2 and MDA levels in female professional volleyball players, in compared to control group.

**Keywords:**Malondialdehyde; interleukin-2; resveratrol; tumor necrosis factor-α; stress oxidative.

## Introduction

Aerobic and anaerobic exercises are sources of free radical production and the following oxidative stress effects can lead to the various oxidative damage and inflammation status [1]. The strong link between inflammatory mediators and different pathological outcomes including glucose intolerance, elevated blood pressure and related- complications such as cardiovascular disorders is a common health concern [2-4]. Antioxidants factors can be assumed as an available strategy for controlling the heavy burden of oxidative elements. Flavonoids and polyphenols are a wide division of these useful nutrients which their oxidative stress roles can observe both in vitro and in vivo. Resveratrol as a major antioxidative and anti-inflammatory flavonoid member can be effective in inhibiting and lowering the health threatening effects of reactive oxygen species. These polyphenol which can be found basically in different plant source foods such as red grape, red wine and peanut. This is an active component in Chinese and Japanese traditional medicine and dried roots of polygonumcuspidatum is the other main resveratrol source which plays a protective role in various kinds of cardiometabolic diseases and inflammation, hypertension, allergy and dyslipidemia. This antioxidant can regulate lipid and lipoprotein metabolism, inhibit

***Corresponding Author:** Maghsoudi Z, Food Security Research Center and department of Community Nutrition, Isfahan University of Medical Sciences, Isfahan, Iran. Tel: +03137922742; Fax:+03136681378; E-mail: nutritionist2020@yahoo.com

platelet aggregation and vasodilator [5-7]. It can act as one of the most important enhancer of lifespan and it seems that its anti-inflammatory factors may be mediated the lowering different cell metabolism disorders and their irreversible metabolic disturbance. Confirming the mentioned benefits of resveratrol can be a useful approach for nursing team and medical members of sports medicine to care athletes' health. Limited number of studies concentrated on the effects of resveratrol on various health indicators in human study, and the previous trials have not been explored the mentioned effects in volleyball athletes. In the present clinical trial, we tried to assess the effects of dried roots of polygonumcuspidatum as a resveratrol source on oxidative stress and inflammatory markers in professional volleyball players.

## Materials and Methods

This randomized and double blinded clinical trial which was performed on 24 professional female volleyball players between 17 and 35 years old. Performing of the present trial was approved in Ethical Committee of Isfahan University of Medical Sciences. Written consents were obtained from eligible athletes, after explaining the aim and process of this trial. Inclusion criteria were determined as having a history of exercise for at least 3 years. However, subjects who had taken any corticosteroid drugs or multivitamin and mineral supplements over the previous 2 weeks were extracted from the study. In addition, subjects who followed lower than 80% of trial procedure, experiences any kinds of sickness or having history of smoking or any chronic or metabolic diseases such as hemolytic anemia, kidney disorders, liver diseases, thyroid disturbances and muscular disorders were excluded, too. Sample size of trial was determined using the following formula: , ($\alpha$=0.05, $\beta$=0.2) and d=0.25. Participants were matched using stratified randomization method by age and random permuted block design was used in order to assign subjects into two intervention or control groups. Intervention group was taken a 40 milligram resveratrol pill (Pure Encapsulations, USA), for 11 weeks, daily; while control group received a 40 milligram placebo pills. It should be mentioned that color, odor, shape and taste of placebo pills were nearly similar to the anthocyanin pills and we used corn as their filler content. Placebo had been made in pharmacy department of Isfahan University of Medical Sciences, Isfahan, Iran. Participants asked to follow their usual diet plan and weekly physical activity program during the study period. Food intake of participants was taken before and after intervention period. Twenty four food recalls had been gained in 3 weekdays and 3 weekend days. Dietary consumption had been analyzed using Nutritionist IV software (First Data Bank, San Bruno, CA, USA).

### Anthropometric measurement

Anthropometric measurements such as body weight and height of subjects had been taken at baseline and at end of the study. Weight is measured with light dresses, barefoot using Seca Scale nearest to 100 grams deghat (Seca Model 770, Humburg, Germany). Athletes' height was assessed using an un-stretchable meter. Body mass index (BMI) was calculated by the following formula: body weight (kg) divided by height (squared cm).

### Biochemical measurement

Blood sampling were done after 2 hours of severe endurance activity at a determined hours a day at baseline and after intervention program. Ten ml of venous blood had been centrifuged at 1000g for 10 minutes. F2-Isoprostane level was assessed using Bender Medsystems GmbH Kit, Vienna, Austria. Serum C-reactive protein (CRP) concentration was measured using high-sensitivity enzyme (Pars Tehran kit, Tehran, Iran). MDA was measured using HPLC method (Agilent Technologies 1200 series, USA; kits: Immuchrom GmbH, Germany). IL-2 plasma was calculated by Human IL2 kit of eBioscience company. Serum TNF-α were measured by sandwich enzyme-linked immunosorbent assay method (Bender MedSystems, Austria).

### Adherence of intervention

We used programmed phone calls or sending text messages to subjects in order to mentioning taking pills. At endpoint of the intervention period, numbers of remained pills were checked to assess participants' adherence to study protocol.

### Statistical analysis

Quantitative data are shown in mean and standard deviation (mean ± SD) and qualitative data are shown in frequency and its' percent. Comparison of data before and after intervention period had been done using paired t-test and independent sample t-test was used to compare quantitative baseline values. Analysis of data had been performed using SPSS software (version 16; SPSS, Inc., Chicago, IL, USA). Values lower than 0.05 were set as significant level.

## Results

A total of 24 participants completed the intervention. Baseline age and anthropometric characteristics of subjects are presented in Table 1. There was no statistically significant difference in age, weight and BMI between individuals in pyridoxine and those in placebo groups at baseline. In addition, average of plasma TNF-α, MDA and IL-2 levels were shown in Table 2. Baseline plasma concentrations of the mentioned indices were not different significantly, too. IL-2 and TNF-α levels decreased in both groups after intervention period, but these reductions were significant only in resveratrol group. Lowering MDA values in intervention and

**Table 1:** Age and anthropometric characteristics of subjects ($\bar{x}$ ±SD).

| Varibles | Resveratrol | Placebo | P value |
|---|---|---|---|
| **Age (year)** | 23.5±3.3 | 24.5±2.5 | 0.6 |
| **Weight (kg)** | 58.4± 5.6 | 61.1± 3.2 | 0.23 |
| **BMI (kg/m2)** | 23.1±2.3 | 23.7±1.2 | 0.18 |

**Table 2:** Biochemical parameters in two groups before and after supplementation period.

| Parameters | Resveratrol group | | | Placebo group | | |
|---|---|---|---|---|---|---|
| | Baseline values | change | P value | Baseline values | change | P value |
| IL-2 (pg/ml) | 21.5±14.22 | -8.21±5.06 | 0.03* | 17.15±7.8 | -2.18±3.1 | 0.2 |
| TNF-α (pg/ml) | 8.56±6.2 | -4.2±2.1 | 0.02* | 12.33±5.6 | -0.81±1.15 | 0.4 |
| MDA (nmol/l) | 2.42±1.2 | 0.16±1.02 | 0.14 | 3.15±1.09 | 0.36±0.21 | 0.72 |

placebo groups were not as statistically significant level. Comparison of biochemical parameters as inflammatory biomarkers and oxidative stress in two groups after supplementation period did not reflect significant difference (data not shown).

## Discussion

This study investigated the effect of resveratrol containing supplements on plasma TNF-α, MDA and IL-2 levels in female professional volleyball players. In the present double-blind controlled clinical trial, intake of resveratrol supplements for a period of 11 weeks. Plasma concentrations of TNF-α and IL-2 demonstrate a significant reduction ($P < 0.05$) and our findings were similar to the previous studies. Bujanda et al. observed that TNF-α lower after intervention with resveratrol containing formula in rats [8]. In addition, Ghanim et al. found a reduction in plasma levels of TNF-α and IL-6, after 1.5 months of following of taking resveratrol supplements, however this lowering level did not seen in placebo group [9]. In the second study of Ghanim et al., the anti-inflammatory effects of resveratrol supplements as a good polyphenol source confirmed in healthy humans, too[10].

Free radicals production of either aerobic or anaerobic exercise plans can accompany with risk of oxidative stress, and its following damage and inflammation. [1] These effects can strength in various strenuous exercise and it may cause a sequential release of inflammatory markers such as TNF-α and different pro-inflammatory cytokines. These improper production of blood levels are comparable to the effects of bacterial function.[11] It seems that the protective roles of resveratrol content is based on its down-regulating effects on inflammatory reactions, through suppressing the production of pro-inflammatory substances and inhibition of nuclear factor-κB expression and production.[12–14]. Nursing team members of sports medicine can use these findings in guidance of elite athletes' health during and after exercise periods.

As we know, this study is the first investigation on the roles of resveratrol supplement in female professional volleyball players. It should be mentioned that there are several limitations in the present trial. First, the small number of elite athletes causes a limited availability to conduct the intervention. Second, there is possibility that following the intervention in a longer period may lead to the different results. Third, measuring plasma resveratrol concentration was not performed in the present study.

In conclusion, this investigation did not indicate a lowering effect of resveratrol supplements on plasma TNF-α, MDA and IL-2 levels in comparison with placebo.

## Acknowledgement

We thank the kind assistance of all professional individuals. This trial was supported by the support of Isfahan University of Medical Sciences, Isfahan, Iran. We also like to thank the cooperation of colleges in Food Security Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

## Conflict of interest

It should be mentioned that no one of the authors had any types of conflicts of interest.

## References

1. Cubrilo D, Djordjevic D, Zivkovic V, Djuric D, Blagojevic D, Spasic M, et al. (2011). Oxidative stress and nitrite dynamics under maximal load in elite athletes: Relation to sport type. Mol Cell Biochem, 355: 273–279.
2. Dandona P, Aljada A, Bandyopadhyay A (2004). Inflammation: The link between insulin resistance, obesity and diabetes. Trends Immunol, 25: 4–7.
3. Vaziri ND, Rodríguez-Iturbe B (2006). Mechanisms of disease: oxidative stress and inflammation in the pathogenesis of hypertension. Nat ClinPractNephrol, 2 :582–593.
4. Davì G, Falco A. Oxidant stress, inflammation and atherogenesis. Lupus. 2005; 14: 760–764.
5. Ikizler M, Ovali C, Dernek S, Erkasap N, Sevin B, Kaygisiz Z, et al (2006). Protective effects of resveratrol in ischemia-reperfusion injury of skeletal muscle: A clinically relevant animal model for lower extremity ischemia. Chin J Physiol, 49:204–209.
6. Murase T, Haramizu S, Ota N, Hase T (2009). Suppression of the aging-associated decline in physical performance by a combination of resveratrol intake and habitual exercise in senescence-accelerated mice. Biogerontology, 10:423–434.
7. Juan ME, Vinardell MP, Planas JM (2002). The daily oral administration of high doses of trans-resveratrol to rats for 28 days is not harmful. J Nutr, 132:257–260.
8. Bujanda L, Hijona E, Larzabal M, Beraza M, Aldazabal P, García-Urkia N, et al (2008). Resveratrol inhibits nonalcoholic fatty liver disease in rats. BMC Gastroenterol , 8:40.
9. Ghanim H, Sia CL, Abuaysheh S, Korzeniewski K, Patnaik P, Marumganti A, et al (2010). An anti-inflammatory and reactive oxygen species suppressive effects of an extract of Polygonumcuspidatum containing resveratrol. J ClinEndocrinolMetab, (e1-8): 95.

10. Ghanim H, Sia CL, Korzeniewski K, Lohano T, Abuaysheh S, Marumganti A, et al (2011). A resveratrol and polyphenol preparation suppresses oxidative and inflammatory stress response to a high-fat, high-carbohydrate meal. J ClinEndocrinolMetab ,96:1409–1414.
11. Pedersen BK, Ostrowski K, Rohde T, Bruunsgaard H (1998). The cytokine response to strenuous exercise. Can J PhysiolPharmacol, 76:505–511.
12. De la Lastra CA, Villegas I (2005). Resveratrol as an anti-inflammatory and anti-aging agent: Mechanisms and clinical implications. MolNutr Food Res, 49:405–430.
13. Rahnama N (2012). Preventing sport injuries: improving performance. Int J Prev Med, 3:143–144.
14. Asgari SA, Mohammadi M (2011). The role of intraprostatic inflammation in the acute urinary retention. Int J Prev Med, 2:28–31.