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Estimation of effect a low intensity cycling on proinflammatory adipokine resistin

Kaboli Mohamadzaman*, Ferizadeh Abbas, Safdari Yazdan, Balali Jafar

Department of Physical Education and Sport Sciences, South Tehran Branch, Islamic Azad University, Tehran, Iran

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Abstract

Resistin, an adipocyte-derived factor, is associated with obesity and body fat, while others failed to observe such correlations. This study was aimed to estimate serum resistin in response to one session moderate exercise in obese men. So, we measured serum resistin concentration before and immediately after exercise (moderate short-time cycling test) in fifteen adult obese men. All subjects were non smoker and non-athletes. Independent sample T-test was used to compare the serum levels of resistin between pre and post test. A P-value of < 0.05 was considered to be statistically significant. No significant difference was found in serum resistin by cycling exercise with compared to pretest (from 2.60 ± 1.9 to 2.82 ± 1.54 ng/ml $p=0.436$). Our findings indicate that a short-time low-intensity cycling does not affect proinflammatory adipokine resistin in obese men.

* **Corresponding Author:** Kaboli Mohamadzaman ✉ m.kaboli1349@yahoo.com

Introduction

It was believed in the past that adipose tissue is inert and is important only as triglycerides storage, but today it is well known that adipose tissue releases some bioactive proteins known as adipokines and thereby systemic increases inflammation in obese subjects and obesity related diseases. Scientific resources suggest the potential impact of the secretion of certain peptide hormones such as leptin, ghrelin, resistin and other pro-inflammatory and anti-inflammatory cytokines on the incidence of obesity and its related disorders. Additionally, there is now evidence that adipocytes release various protein signals such as inflammatory cytokines. Throughout obesity gene expression of a variety of inflammations in released by adipose tissue is increased (Uysal *et al.*, 1997).

Among adipokines, resistin is another adipose tissue-derived cytokine discovered in 2001 (Steppan *et al.*, 2001). Resistin is one of the adipocytokines with a molecular weight of 12.5 KD. In addition to adipocytes, this adipocytokine is released in muscles, pancreatic islets, and mononuclear cells and in human placenta (Reilly *et al.*, 2005). In contrast to resistin expression in rats, human resistin is expressed primarily in macrophages and not in adipose tissue (Tomaru *et al.*, 2009). In humans and rodents, an increased level of serum resistin is associated with insulin resistance. Impaired glucose tolerance and reduced insulin function by resistin indicates that resistin is effective in the link between obesity and diabetes (Steppan *et al.*, 2001). The study of Lee *et al* found that obese rat models have higher resistin levels compared with their lean counterparts (Lee *et al.*, 2005). Further studies in rodents suggest that levels of mRNA resistin reserves are richer in abdominal fat than thigh fat (Weyer, 2001). Based on conducted studies, patients with type 2 diabetes categorized as obese have higher concentrations of resistin compared to healthy individuals, which is associated with insulin resistance (Al-Harithy *et al.*, 2005). But its role in humans is not known precisely. On the other hand, Liu's study (2006) showed that resistin has a positive and significant correlation with BMI, WHR, body fat percentage, and glucose and serum insulin (Liu *et al.*, 2006). But Janoska (2006) points out that serum resistin levels are not correlated with BMI in obese women (Janowska *et al.*, 2006). Findings about the relationship between resistin with obesity determinant indicators are conflicting and so are the findings on response of this cytokine to training programs. Some sources report reduction (Valsamakis *et al.*, 2004) and others report no change in resistin (Kelly *et al.*, 2007) in response to long-term exercise. Moreover, since by now there are few studies on resistin response to short-term exercise which signifies studies in this area.

Method and subjects

In this study, we aimed to evaluate effects of single bout low intensity cycling test on proinflammatory adipokine resistin in adult obese men. This study was approved by Ethics Committees of Islamic Azad University, Iran. Participants included fifteen healthy non-trained abdominally obese men aged 35.4 ± 2.4 years. After the nature of the study was explained in detail, informed consent was obtained from all participants.

All subjects had a BMI of upper than 30. All subjects were non-smokers and non-alcoholic. Participants were included if they had not been involved in regular physical activity/diet in the previous 6 months. Subjects with any history of smoking, chronic cough, recurrent respiratory tract infection, history of chest or spinal deformity, diabetic, personal history of asthma, chronic obstructive lung diseases were excluded from the study.

Anthropometric measurements (body height and weight, waist and hip circumference) were performed with the subjects wearing light underwear and without shoes. Body mass index (BMI) was calculated as weight (kg) divided by squared height (m). Waist and hip circumferences were measured and a waist-to-hip ratio (WHR) was calculated. Abdominal circumference and hip circumference were measured in the most condensed part using a non-elastic cloth meter.

In next stage, all participants were completed a single bout cycling test according to YMCA protocol (Mullis *et al.*, 1999). Serum resistin measured before and immediately after cycling test. Blood samples were centrifuged for 10 minutes by 3000 rpm speed for serum separation. Serum resistin (Biovendor-Laboratoria medicina a.s. Czech) was quantified using commercially available enzyme-linked immunosorbent assay kits. The inter- and intra-assay coefficients of variance were 5.2 and 3.4% for resistin. Subjects were asked to avoid doing any heavy physical activity for 48 hours before blood sampling.

Data analysis

Statistical analysis was performed with the SPSS software version 16.0. Normal distribution of data was analyzed by the Kolmogorov-Smirnov normality test. Independent sample T-test was used to compare the serum resistin between pre and post test. A p-value of less than 0.05 was considered to be statistically significant.

Results

Anthropometric characteristics of the study participants are described in Table 1. Data were expressed as individual values or the mean ± SD. No significant difference were found in serum resistin values between pre and post test (from 2.60 ± 1.9 to 2.82 ± 1.54 ng/ml p=0.436, Fig 1).

Table 1. Mean and standard deviation of anthropometrical markers in studied subjects.

Variables	Age (years)	Weight (kg)	Height (cm)	BMI (kg/m²)	BF (%)	AC (cm)	HC (cm)	WHO
M ± SD	35.4 ± 2.4	102 ± 11.6	179 ± 4.9	31.9 ± 3.1	31.6 ± 2.8	108 ± 8	107 ± 7.5	1.01 ± 0.22

BMI, body mass index; BF, Body fat percentage; AC, Abdominal circumference; HC, Hip circumference; WHO, abdominal circumference to Hip circumference ratio.

Discussion

Although over the past two decades, numerous studies have supported the effect of exercise on inflammatory or anti-inflammatory cytokine and adipokines levels the findings of the recent study showed that one cycling exercise with relatively moderate intensity and relatively short execution time would not change serum resistin levels compared to the baseline levels. Although to date there have been few studies on the acute effect of a short-term exercise on resistin levels, the findings on the response of this inflammatory cytokine to a long-term training are not consistent and there is still no overall consensus on this issue. For example, in a recent study, despite a significant reduction in body weight due to 12 weeks of exercise on obese patients, no significant changes were observed in serum resistin levels (De Luis *et al.*, 2004), but the findings of another study show that physical activity, even in the absence of weight loss leads to a significant reduction of resistin and other inflammatory cytokines such as IL-6 (Kadoglou *et al.*, 2007). However, in another study, a low calorie diet plan for weight loss was associated with a 63-percent reduction of leptin and resistin levels were unchanged (Wolfe *et al.*, 2004).

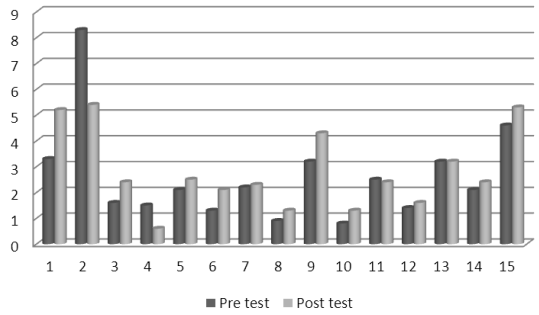

Fig 1. Pre and post values of serum resistin in studied subjects. Each pair of vertical columns represents one subject.

In the present study, different mechanisms can be attributed to the lack of response of resistin to cycling exercise. Longitudinal studies have shown that regular exercise has anti-inflammatory effects and leads to decreased levels of inflammatory markers

(Moschen *et al.*, 2010). Some recent studies, however, suggest that single sessions of exercise lead to acute increase of inflammatory cytokines in which case it indicates the inflammatory effect of short-term exercise immediately after termination of the test. But unchanged serum resistin pursuant to this exercise protocol suggests the inflammatory effect of short term cycling exercise with relatively low intensity. Moreover, it is possible that serum resistin response to short-term exercise is a delayed response rather than an acute one. In fact, it is likely that one exercise session results in significant changes of inflammatory or anti-inflammatory cytokines in the period of delay after the cessation of exercise test. In this context, the latency of some other cytokine such as leptin to one exercise session has been reported by some researchers (Essig *et al.*, 2000; Duclos *et al.*, 1999). Despite these statements, the findings of Jamortaz (2006) showed that a single bout of sub-maximal exercise would have no effect on resistin levels immediately after cessation of exercise until 48 hours later (Jamurtas *et al.*, 2006).

There is also the possibility that baseline serum resistin levels in these obese subjects did not significantly differ from those with normal body weight. If so it is, its remaining unchanged or its decrease can perhaps be attributed to the pre-test normal baseline resistin levels. In this context, although some studies have suggested that serum resistin levels are higher in obese than in lean or normal-weight subjects (Steppan *et al.*, 2001; Wang *et al.*, 2010; Kim *et al.*, 2001), the findings of some recent studies have also shown that there is no significant difference in the levels of resistin in lean, obese and insulin resistant groups (Utzschneider *et al.*, 2005). Reinher *et al* (2006) did not find significant differences in baseline serum resistin levels between lean and obese subjects (Reinehr *et al.*, 2005). The similarity between the baseline resistin in lean and obese subjects has also been reported in the study by Zhu *et al* (2007) (Zou *et al.*, 2004). Finally it is reminded that the lack of a control group with normal weight is one of limitations of the present study.

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