



RESEARCH PAPER

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The effect of moderate running test on serum TNF- α in obese men

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Abstract

The aim of this study was to evaluate the effects of an exercise test on serum TNF- α level in adult obese men. For this purpose, fifteen non-trained adult obese men (aged 38.3 ± 2.29 year, weight 94.8 ± 7.2 kg, BMI 31.8 ± 1.7 kg/m²) were participated by accessible sampling. Venous Blood samples were taken after a rest of 20 minutes (baseline) and immediately after a moderate running test for forty minute at 75(%) of maximal heart rate in order to measuring serum TNF- α . Student's paired 't' test was applied to compare the pre and post exercise values. No significant differences were found in serum TNF- α by exercise test with compared to baseline. Based on this data, we conclude that one session of running test with moderate intensity for short time cannot change serum TNF- α in obese men.

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Introduction

Obesity especially central obesity is associated with numerous chronic diseases such as impairment of glucose tolerance, dyslipidaemia and systemic hypertension and these features constitute the metabolic syndrome, and each is known to be associated with increased cardiovascular risk (Timar *et al.*, 2000). In general definition, cytokines act as catabolic factors involved in the pathogenesis of muscle wasting and chronic metabolic diseases (Anker^a*et al.*, 2004; Anker^b*et al.*, 2004).

The inflammatory cytokines are produced by different cell types such as adipose tissue and are released into circulation where they regulate different tissues through their local, central, or peripheral actions (Bruunet *et al.*, 2003).

Tumour necrosis factor alpha (TNF- α) is an adipocytokine involved in systemic inflammation and it has been suggested that this cytokine stimulates the acute phase reaction (Moller *et al.*, 2000). Among inflammatory cytokines, circulating levels of TNF- α is 7.5 times more by the adipose tissue in obese subjects compared with lean counterparts (Kern *et al.*, 1995) and plasma concentrations of this cytokine have been positively correlated with elevated plasma triglycerides (Jovinge *et al.*, 1998).

It has been demonstrated that high serum TNF-alpha is associated with reduced skeletal muscle cross-sectional area and peripheral muscle strength (Niebauer, 2000). The authors concluded that TNF- α induces the over-production of VLDL particles, which might explain its direct relationship with plasma triglycerides (Qin *et al.*, 2008).

Numerous epidemiological studies and clinical studies have demonstrated that contradictory findings related to dietary or exercise interventions and the resulting alterations in plasma cytokines. Weight reduction improves insulin sensitivity and improves diseases associated with the metabolic syndrome (Sjostrom *et al.*, 1999; Ikeda *et al.*, 1996; Dengelet *et al.*, 1998). One previous study was reported a

borderline significant relation between serum TNF- α and aerobic capacity on obese subjects (Eizadiet *et al.*, 2011). Some previous studies have demonstrated that TNF- α may be reduced with weight loss interventions such as diet or exercise training intervention (Bastard *et al.*, 2000; Sharman *et al.*, 2004), but there limited studies about TNF- α responses to short-term or acute exercise in obese subjects or another population. Therefore, this study aimed to evaluate serum TNF- α response to one session running test in adult obese men.

Materials and methods

Subjects

In this study, to investigate serum TNF- α response to one session running test, fifteen non-trained adult obese men were participated by accessible sampling. The study protocol was approved by the ethics committee of Islamic Azad University, Iran. All of subjects had not participated in regular exercise for the preceding 6 months. A detailed history and physical examination of each subject was carried out. Having history of known hyperlipidemia, hypertension, coronary artery disease, cerebrovascular disease, and peripheral artery disease, diagnosed type 2 diabetes, using medicine or hormone preparations that affect the carbohydrate and lipid metabolism. After the nature of the study was explained in detail, informed consent was obtained from all participants.

Body weight and height were measured with a standard physician's scale and a stadiometer, respectively when subjects were in a fasting state. Abdominal obesity was determined as waist circumference measured in a standing position. Body Mass index (BMI) was calculated using the formula body weight/height² in terms of kg/m².

Blood sampling and protocol

After anthropometrical measurement, all participants asked to attend laboratory for blood sampling after overnight fast between 8 a.m to 9 a.m. Subjects were asked to avoid doing any heavy physical activity for 48 hours before blood sampling. Venous Blood

samples were taken after a rest of 20 minutes (baseline) and immediately after a moderate running test for forty minute at 75(%) of maximal heart rate. Time and exercise intensity was equal for all participants. Blood samples were collected in order to measuring serum TNF- α . Blood samples were dispensed into EDTA-coated tubes and centrifuged for 10 minutes in order to separate serum. The samples were subsequently stored at - 80°C until assayed. Serum TNF- α was determined by ELISA method (Enzyme-linked Immunosorbent Assay for quantitative detection of human TNF- α total). The intra-assay and inter-assay coefficient of variation of TNF- α were 6% and 7.4% respectively and sensitivity of the method was 5.0 pg/mL.

Statistical analysis

Statistical analyses of data were performed using the SPSS software version 15.0. The Kolmogorov-Smirnov test was applied to determine the variables with normal distribution. Student's t-tests for paired samples were performed to determine significance of changes in variables by exercise test. All statistical tests were performed and considered significant at a $P \leq 0.05$.

Results

Accordance with whatabovementioned, this study investigated serum TNF- α responses to one exercise test included 40 min running test at 75(%) of maximal heart rate in adult obese men. Anthropometric characteristics of the study participants are described in Table 1. The data were

reported as mean and standard deviation. The data shows those participants are obese. The data of Student's t-tests for paired samples shows that serum TNF- α did not change by exercise test when compared with pretest (38.64 +/- 11.26 vs. 37.47 +/- 9.73 pg/ml, $P = 0.308$) (Fig 1).

Discussion

In this study, the effect of one session exercise on serum TNF- α was evaluated. Our data showed no significant change in this inflammatory cytokine by exercise test that included 40 min running test at 75 % of maximal heart rate in obese subjects. Many studies indicate that the greatest mRNA expression is found in the adipocytes and it is the most-studied mRNA expression in white adipose tissue (Montague, 2002). The physiological and immunological properties of this cytokine in adipose tissue play a pivotal role in the production of several other cytokines such as IL-10 and Leptin (Coppack, 2001; Trayhurn *et al.*, 2005).

It is important to study this cytokine is produced 7.5 times more by the adipose tissue in obese subjects compared with lean counterparts (Kern *et al.*, 1995). Marked evidence indicates that exercise training can be improve the inflammatory profile in chronic diseases cardiovascular patients by inhibition of cytokine-chemokine production, regulation of monocyte activation and inhibition of inflammatory cell-growth signals and reduction of soluble apoptosis signalling molecules (Ferrazet *et al.*, 2004).

Table 1. The Table illustrates the volunteers' anthropometrical markers characteristics.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	15	34	41	38.33	2.289
Height	15	162	177	172.53	4.612
Weight	15	82	105	94.80	7.193
Abdominal	15	96	109	104.33	4.117
Hip	15	98	114	105.33	4.670
WHO	15	.95	1.05	.9910	.02658
BMI	15	29	35	31.82	1.719
%fat	15	29	37	32.55	2.058
Visceral Fat	15	11	16	12.53	1.598

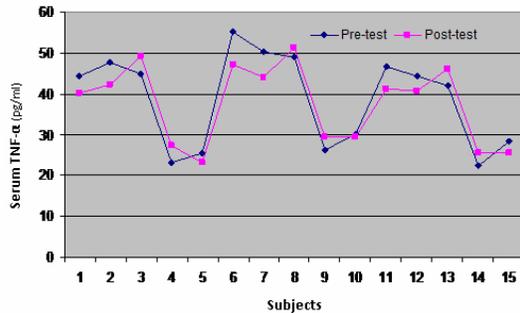


Fig. 1. pre and post exercise of serum TNF- α . Each number of vertical columns represents one subject. The figure shows that serum TNF- α did not change significantly by exercise test in studied subjects.

However, some previous studies have pointed the beneficial effect of exercise on the other inflammation or anti-inflammatory cytokines, although the molecular mechanisms for this are less understood. But our study showed no change in this cytokine in response to exercise test. It seems that the effect of exercise is dependant to kind of exercise, duration and intensity of exercise session. This is possible despite the lack of change in serum or plasma cytokine levels in response to exercise, but the expression of receptors are affected by exercise. To support of this statement, the finding of a recent study with four months exercise showed that combined endurance/resistance training reduced TNF-alpha receptor levels (TNFR1 and TNFR2) that was associated with significant increase in peak VO₂ in patients with ischemic cardiomyopathy, although changes in IL-6 and TNF-alpha were not apparent (16 of 168). In addition, despite no significant change in IL-6, C-reactive protein (CRP), or TNF-alpha following 6 weeks exercise included cycling but TNF-alpha receptors was improved significantly (LeMaitre *et al.*, 2004). Of course, most of above mentioned studies included long-term exercise training program, but our study involved one session exercise. Lack change in serum TNF-a in our study may be short-time of exercise test. To support this hypothesis, the results of a study showed that short-term exercise can not affect serum leptin as another cytokine (Bouassida *et al.*, 2010). The authors concluded that short-term exercise (60 min) or exercise that generates an energy expenditure lower

than 800 kcal cannot improve inflammation profile (Bouassida *et al.*, 2010). It is also possible that short-term or acute exercise affect cytokines in recovery period after exercise not immediately after exercise. On the other hand, some leading researchers in this area believe that exercise training may induce local anti-inflammatory effects in skeletal muscle that may not be reflected in the systemic circulation (Gielen *et al.*, 2003; Charles *et al.*, 2008). These authors noted that cytokine gene expression in muscle is derived from muscle, as serum concentrations of TNF- α did not change with exercise but the mRNAs for these cytokines were reduced in muscle as a result of exercise (Charles *et al.*, 2008).

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