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Moderate exercise can be improve inflammatory profile with emphasis on interleukin 1 beta

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ABSTRACT: Obesity is a major health problem and is associated with low-grade systemic inflammation. Despite abundant studies about the role of chronic exercise training on inflammatory profile, acute response of inflammatory mediators to one bout exercise test are still not completely elucidated. For this reason, in this study, we investigated the effect of one bout exercise included 40 min running without slope at 65(%) of maximal heart rate on serum Interleukin- 1 beta (IL-1 β) in fifteen adult obese males aged 39.4 ± 1.9 years and body mass index (BMI) 31.3 ± 1.4 kg/m^2 were selected to participate in this study by accidentally. Anthropometrical markers were measured. Venous blood samples were collected immediately before and after exercise test with regard to measuring serum IL-1 β. Student's t-tests for paired samples were performed to determine change between pre and post test. A p value less than 0.05 was considered statistically signigcant. Based on statistical data, exercise test resulted significantly decrease in serum IL-1 β in studied subjects. In conclusion, we can say one bout exercise test with moderate intensity can be improved IL-1 β as an inflammatory cytokine. However further studies are necessary to elucidate the significance of exercise on inflammatory profile and is need to determine acute response of other cytokines to exercise.

Keywords: Exercise, Obesity, Inflammatory profile

INTRODUCTION

Similar to other cytokines, interleukines-1 including interleukin-1 alpha (IL-1α) and Interleukin- 1 beta (IL-1 β) are involved in creation of innate and inflammatory immune responses. IL-1 β is one of the most potent pro-inflammatory cytokine that has the metabolic and immunologic function [1]. It has been long known that this cytokine expressed by many cells, including monocyte and neutrophils and via CRP effect [2]. Marked evidence indicates that this inflammatory cytokine has been associated with increased cardiovascular risk [3].

This inflammatory cytokine, in addition to inflammatory and respiratory disease, is also associated with metabolic disturbances effective on obesity and the body fat regulation. A growing body of evidence supports the notion that an increase in systemic levels of IL-1β is associated with increased insulin resistance and intensity of type II diabetes [4, 5]. Accumulating evidence indicates that its level to be increased in obesity [6]. Some previous studies have indicated an association of direct relation between serum IL-1 β and body mass index [7]. In contrary, in another study, no significant association was found between IL-1 β and BMI [8].

It has been hypothesized that weight loss in obese people results in significant reduction in this inflammatory cytokine, although the specific mechanisms responsible for these observations are not obvious. For this purpose, several small studies have documented effects of weight reduction by exercise training on inflammatory profile and/or serum levels of these cytokines such serum IL-1ß. In this are, finding of previous study showed that long term exercise training resulted in a significant decrease in IL-1 β in obese mice [9]. But, it has been reported by another study that circulation IL-1ß did not change after six months of lifestyle change as exercise and varied diet [10]. Nevertheless, it has been known for some time that acute exercises lead to an increase in pro-inflammatory markers in the circulatory pathway [11]. On the other hand, there are limited studies about acute response of inflammatory or anti-inflammatory cytokines particularly serum IL-1β to on bout exercise in various population. This study aimed to assess acute response of serum IL-1β to moderate running test in obese men.

METHODS

Human Subjects and study inclusion: As mentioned above, this study aimed to determine whether serum IL-1ß is affect by one bout moderate exercise test in obese men. For this purpose, fifteen apparently healthy obese men were recruited for this study through local advertising. Participants were 39.4 ± 2 years old with a body mass index (BMI) of 31.3 ± 1.4 kg/m^2. The protocol was approved by the Ethics Committee of Islamic Azad University, Shahr-e-Qods Branch, Iran. Written consent was obtained from each subject after the experimental procedures and possible risks and benefits were clearly explained. Participants were non-athletes, non-smokers and non-alcoholics. All participants had not participated in regular exercise/diet programs for the preceding 6 months. Subjects with history of smoking and patients with gross abnormalities of the thoracic cage which may interfere with lung function test were also excluded from the study. Subjects with a history or clinical evidence of impaired fasting glucose or diabetes, recent myocardial infarction, active liver or kidney disease, the other chronic were excluded.

Anthropometriy: Anthropometric measurements were made by the same trained general physician. The weight and height of the participants were measured in the morning, in fasting condition, standing when the participant had thin clothes on and was wearing no shoes. Abdominal circumference and hip circumference were measured in the most condensed part using a non-elastic cloth meter. Hip circumference was measured at the level of the greater trochanter. Body mass index (kg/m²) was calculated as weight (kg) divided by squared height (m^2). Visceral fat and body fat percentage was determined using body composition monitor (OMRON, Finland).

Laboratory Analyses and exercise: For measuring serum IL-1 β, blood samples were collected via the cannulated antecubital vein before and immediately after exercise test. The subjects did not perform any serious physical activity for 48 hours before the blood collection. All blood samples were separated serum for calculation serum IL-1ß. Exercise test lasted 40 min with 65 (%) of maximal heart rate involved running on flat surface with no slope. Target heart rate was controlled with polar telemetry. ELISA method (Enzyme-linked Immunosorbent Assay for quantitative detection of human IL-1β, Czech) used for determine serum IL-1ß. Intra and inter-assay coefficients of variation were 5.1 and 8.6%, respectively.

Statistical analysis: Statistic analysis was done with SPSS 15.0 for Windows. The Kolmogorov-Smirnov test was applied to determine the variables with normal distribution. Student's t-tests for paired samples were performed to determine change between pre and post test. A p value less than 0.05 was considered statistically signigcant.

RESULTS

In present study, serum IL-1β response to one bout running test (40 min at %65 VO2max) were measured in adult obese men. Table 1 show the descriptive anthropometric and biochemical features of the study subjects. The data were reported as mean and standard deviation.

Based on Pearson correlation method, serum IL-1β was not correlated with anthropometrical markers at both pre and post test. Lack correlation between IL-1β and body weight at baseline (p = 0.39, r = 0.24, Fig. 1). Data of statistical analysis showed that exercise tees resulted in significant decrease in serum IL-1β in studied subjects (p = 0.036, Fig. 2).

Table: Body weight and blood chemistry parameters in studied subjects

	Minimum	Maximum	Mean	Std. Deviation
Age	35	42	39.40	1.993
Height	165	178	173.80	3.783
Weight	82	104	94.60	6.631
Abdominal 1	97	110	104.53	4.324
Hip	96	113	104.33	4.909
WHO	.97	1.03	1.0023	.01684
BMI	29.05	33.96	31.2856	1.38601
%fat	30.3	33.6	31.700	1.0508
Visceral Fat	11	17	13.40	1.682
IL-1B (pre-test)	4.0	15.2	7.133	3.6773
IL-1B (post-test)	2.9	6.9	5.253	1.2029

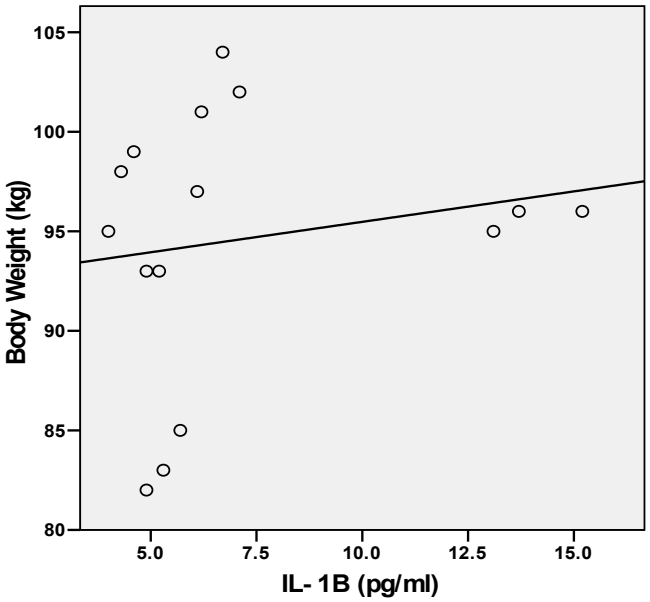

Fig.1. Relationship between serum IL-1β and body weight in studied subjects. No significant correlation.

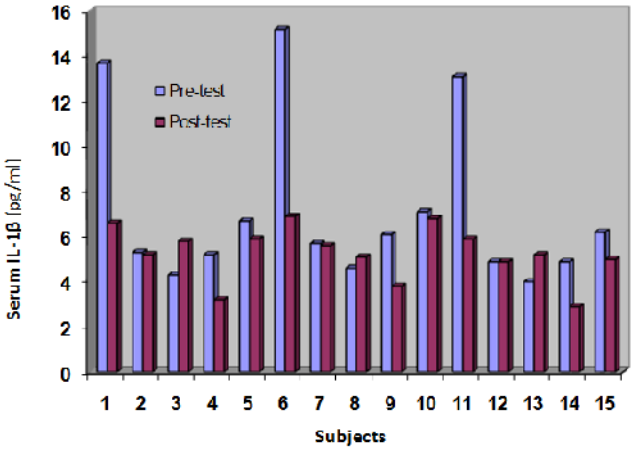

Fig. 2. Serum IL-1β at pre and post exercise in studied subjects. Exercise test resulted in significant decrease in serum IL-1β. Each pair of vertical columns represents one subject.

DISCUSSION

In contrary with some previous study, our study finding showed that single bout exercise can be decrease serum IL-1β as inflammatory cytokine in adult obese men. This study is not the first in the last two decades in measuring adipocytokines secreted from adipose tissue or other tissues in response to different exercise programs; rather, various studies have reported inconsistent findings in terms of immediate or delayed response of inflammatory or anti-inflammatory cytokines. In this area, contrary to these results, Drenth *et al.* has been show the IL-1β production increased two-fold in ten recreational trained athletes immediately after the 5-km run [12].

Unlike the findings of the present study which supports the decrease in IL-1β as an inflammatory cytokine in response to one session running with relatively moderate intensity and duration and mentions the anti-inflammatory effects of this exercise, the findings of another research shows that 60 minutes running with similar intensity has resulted in a two-fold significant increase in this inflammatory cytokine and IL-1β, pointing out the inflammatory impacts of the mentioned exercise test [13]. In another recent study, the researcher stated that acute exercises lead to an increase in pro-inflammatory markers in the circulatory Pathway [11].

These authors suggested that taking into account that exercise intensity could affect the immune response and a graded training has severe problems. In this area, some authors have suggested that the metabolism complication induced by this type of exercise could initiate apoptotic processes, resulting in the lymphopenia observed after this type of exercise [3, 14]. But our study results showed that exercise even for one moderate running can be improved serum IL-1β as an inflammatory cytokine. This important finding supports the anti-inflammatory characteristic of relatively long-term, moderate intensity exercise in obese adult men. However, improvement in serum levels of IL-1β in response to the exercise test in the present study can be attributed to alterations in other inflammatory or anti-inflammatory cytokines such as IL-6. Lack of measurement of the mentioned cytokines was the main limitation of the present study. Although, many previous studies have been suggested higher serum IL-1β in obese than normal weight subjects, our study showed no significant correlation in serum IL-1β with anthropometrical markers in studied obese subjects. However, this unexpected finding is probably due to small number of sample subjects.

Some researchers have suggested that IL-1β increases significantly during endurance sports and after long-term endurance sports [15]. It was reported that one-session high intensity interval training (HIIT) exercise has resulted in heterogeneous findings such as increased IL-10 (as an anti-inflammatory cytokine) and increased IL-6 and TNF-α (as inflammatory cytokines) in young men [16]. Increased IL-1β in response to short-term exercise has reported by other previous studies [17, 18]. A recent study mentioned a decrease in serum leptin without any change in serum adiponectin following 20 minutes biking with an intensity of 60% and 80% maximal oxygen consumption in overweight middle-aged men [19]. However, it is possible that exercise may result in a significant change in levels of receptors or their expression in skeletal muscle or other tissues, despite its ineffectiveness on systemic levels of cytokines. So, increased expression of adiponectin receptors in skeletal muscle following a one-session exercise was observed by another study [20].

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