**Advances in Bioresearch**
Adv. Biores., Vol 5 (2) June 2014: 05-08
©2014 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
ICV 7.20 [Poland]

Advances in Bioresearch

## ORIGINAL ARTICLE

# Short-time Moderate Exercise does not alter Circulating Interleukin 1 Beta as an inflammatory cytokine in Hyperglycemic males

**Hajirasouli Maral[1], *Hajirasouli Masoud[1], Sokhanguei Yahya[2], Afsharmand Zohreh[1]**

1. Department of Physical Education and Sport Sciences, Islamshahr Branch, Islamic Azad University, Islamshahr, Iran.
2. Department of Physiotherapy, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran; Department of Physical Education and Sport Sciences, Islamshahr Branch, Islamic Azad University, Islamshahr, Iran.

*E-mail: m_hajirasouli@yahoo.com

**ABSTRACT**

*Pro-inflammatory cytokines such as interleukin 1 beta (IL-1ß) is known to be increased in obesity and related diseases or metabolic syndrome. To examine the impact of one bout exercise test on circulating IL-1ß levels, twelve sedentarily obese men (45 ± 7) were completed one short time cycling test. Exercise test lasted 15 min with moderate intensity. Blood samples were collected pre and post-exercise in order to evaluation serum IL-1ß in all subjects. Statistical analysis was performed with the SPSS software version 15.0. P value of <0.05 was accepted as significant. Based on statistical outcome, serum IL-1ß did not change after exercise test when compared with pretest. Our findings indicate that exercise for short time can not affect inflammation profile in sedentary obese individuals. Further studies are needed to clarify possible role of exercise on inflammation in healthy or disease population.*

***Keywords:*** *Inactive subject, Inflammation, Hyperglycemic, Exercise*

*Received 12/04/2014 Accepted 10/05/2014*



**How to cite this article:**
Hajirasouli M, Hajirasouli M, Sokhanguei Y, Afsharmand Z. Short-time Moderate Exercise does not alter Circulating Interleukin 1 Beta as an inflammatory cytokine in Hyperglycemic males. Adv. Biores. 5[2] 2014; .DOI: 10.15515/abr.0976-4585.5.2.58

## INTRODUCTION

Scientific sources referred to obesity as a history of onset of some cardiovascular and respiratory diseases, metabolic syndrome, and type 2 diabetes [1]. Obesity with a passive diet follows insulin performance disorder. Research findings support a type of close relationship between proinflammatory markers such as interleukin-1 beta (IL-1β) with prevalence of obesity and overweight and its role in fat mass and fat metabolism [2]. The increase of inflammatory cytokines, such as IL-1β was also reported in obese individuals and the ones with type 2 diabetes [3].

Such inflammatory cytokines involve in creating innate and inflammatory immunity responses. It was determined that disorder levels at IL-1β systemic levels follow metabolic disorders affecting obesity and body fat levels [4, 5]. On the other hand, a type of significant relationship was reported between the increase of IL-1β levels and BMI changes [6]. IL-1β was known as the regulator of body inflammatory responses and it plays a crucial role in the relationship between obesity and inflammatory diseases such as diabetes, metabolic syndrome, arthrosclerosis and chronic heart failure [1]. IL-1β generation caused by macrophages in insulin-sensitive organs leads to progressing inflammation and increasing resistance to insulin with obesity and overweight [1].

The findings of some earlier studies indicate that balance of some cytokines and inflammatory markers lead to improving metabolic risk factors due to weight loss caused by exercises and diet in obese individuals with overweight [7]. For instance, findings of a study in this concern showed that regular exercise has anti-inflammatory effects and leads to reduction of inflammatory markers such as IL-1β [8]. However, some studies report ineffectiveness of long-term exercises on the inflammatory markers affecting obesity in obese or diabetic individuals [9, 10]. In spite of contradictory findings on the response of such inflammatory cytokines on long-term exercise program of obese individuals, no study was seen to examine its immediate response to a

relatively short exercise session. Therefore, the present study measures its immediate response to a cycling test session with relatively average intensity and duration on type 2 diabetic males.

## MATERIAL AND METHODS

### Study population

Twelve non-trained males (44±7 yrs, 173±5 cm, and 92±7 kg) were matched according to bodyweight or other anthropometrical markers were selected to participate in the study. All participants were in obesity. All subjects were non-smokers. Inclusion criteria were male, aged 35–50 years, BMI between 30 – 36 kg/m2. Those with a history of type II diabetes or impaired fasting glucose, cardiovascular diseases, active liver or kidney disease and those with present medications were excluded. All subjects were non-smokers and had not participated in regular exercise programs for the preceding 6 months. Participants were informed about the purpose and risks of the study before written informed consent was obtained.

### Anthropometry

Height and weight were measured, and BMI was determined using standard procedures. Weight and height were measured in the morning, in fasting condition, standing, wearing light clothing and no shoes. The BMI was calculated as the weight in kilograms divided by the square of the height in meters. Abdominal-to-hip ratio was calculated as abdominal circumference divided by hip circumference as measured to the nearest 0.5 cm with a standard measuring tape. Waist circumference was measured at the level of the umbilicus using a nonelastic tape to the nearest 0.1 cm. Hip circumference was obtained at the level of largest diameter below the anterior iliac crest. Percentage body fat was measured using body composition monitor (OMRON, Finland).

### Biochemistry and exercise

As previous mentioned, this study aimed to evaluate circulating IL-1ß in response to cycling test in subjects. For this purpose, blood samples were collected before and at the end of exercise test. The subjects were advised to avoid any physical activity or exercise 48 hours before the blood sampling. Exercise test was performed on cycle ergometer in 4 stages with no rest between stages.

The blood was centrifuged immediately in order to separate serum. Serum IL-1ß was determined by ELISA method (Enzyme-linked Immunosorbent Assay for quantitative detection of human IL-1β, Austria). The Intra-assay coefficient of variation and sensitivity of the method were 5.1% and 0.3 pg/mL, respectively.

### Statistical analysis

All values are given as mean and standard deviation. Statistical analysis was performed with the SPSS software version 15.0. Pre- to post exercise change were determined by Student paired *t* tests for serum IL-1ß. A p value of less than 0.05 was considered as statistically significant.

## RESULTS

Anthropometric and physiological characteristics of the study participants are described in Table 1.

All values are reported as mean and standard deviation. Significant correlation was not found in serum IL-1β with anthropometrical markers at baseline. Lack correlation in this inflammatory cytokine can be attributed to small number of studied subjects. In addition, there was no significant differences for serum IL-1β between pre and post exercise (from 2.91 ± 2.41 to 2.51 ± 2.05 pg/ml, Fig 1).

Table 1: Anthropometrical characteristics of 12 male studied subjects

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age (year) | 12 | 32 | 56 | 43.92 | 7.051 |
| Height (cm) | 12 | 165 | 182 | 173.00 | 5.045 |
| Weight (kg) | 12 | 80 | 101 | 92.00 | 7.160 |
| Abdominal (cm) | 12 | 96 | 115 | 104.75 | 6.771 |
| Hip (cm) | 12 | 100 | 109 | 103.83 | 2.588 |
| WHO | 12 | .94 | 1.11 | 1.0092 | .05485 |
| BMI (kg/m2) | 12 | 27 | 36 | 30.67 | 2.708 |

## DISCUSSION

The major finding of the present study is the significant lack of change of IL-1β serum levels to respond the exercise test of the type 2 diabetic patients. In other words, a cycling session with relatively moderate intensity and duration did not lead to any changes on serum levels of IL-1β in type 2 diabetic adult males. So far, many studies have been conducted aiming at determining the effects of short- or long-term exercise programs on serum levels of inflammatory mediators on healthy or diseased people. Different responses were seen

depending on the primary preparedness levels of the population under study, duration and intensity of exercise, type of exercise program, and type of the population under study.

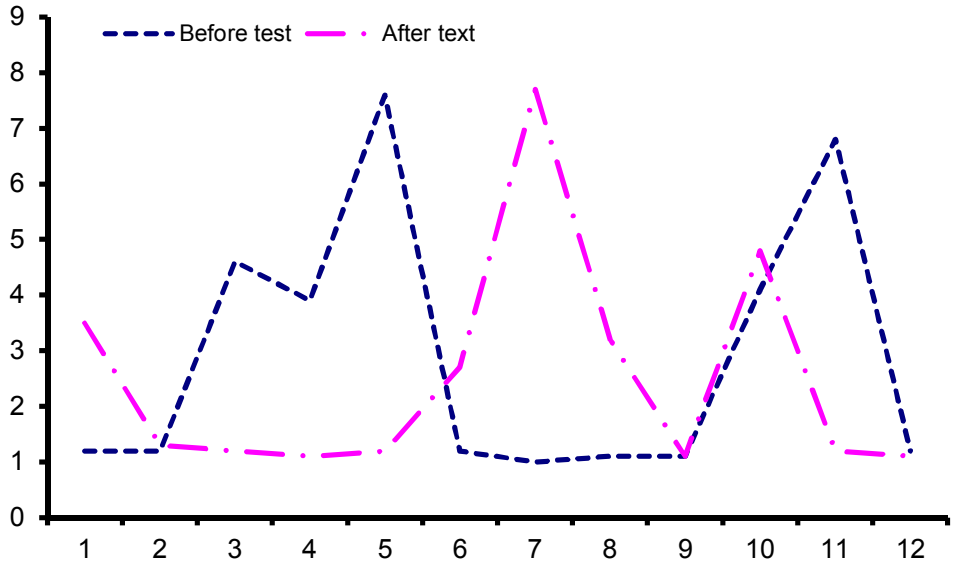


**Fig 1;** The changes pattern of serum IL-1b in response to acute bout cycling test in studied subjects. No significant difference was found in this inflammatory cytokine by exercise test.

It is not beyond expectation that the one-session exercise tests are led to the increase of level of inflammatory cytokines or other mediators. In fact, although most of the scientific studies and the researchers' studies emphasized exercises as a non-pharmaceutical treatment in improving and/or serum or plasma levels of these variables in healthy and diseased people, no general consensus was presented on their responses to one-session exercise tests. On the other hand, most scientific studies in this concern emphasized that one-session exercise tests, especially by non-athlete or inactive people with low primary preparedness act as an inflammatory stress and response of inflammatory cytokines or other inflammatory mediators will be significant [11].

Such conception was adopted, especially in blood samplings immediately after stopping a test on non-athletic people, as several studies noted the significant increase of inflammatory cytokines in response to one-session exercise tests on obese or diseased people [11, 12]. Therefore, researchers discussed the non-inflammatory features hours after the end of exercise test, as most of the recent studies often discussed the delayed responses of such cytokines such as 18, 24, 48, and 72 hours after finishing a test, not immediate responses [13, 14].

It seems that the exercise test of the present study did not have inflammatory features as far as inflammatory cytokines are concerned. The reason is that although IL-1β levels did not subject to a significant change immediately after the exercise test, its insignificant reduction is remarkable as far as clinical perspective is concerned, as it typically supports anti-inflammatory features of the exercise test on type 2 diabetic patients. Of course, if the responses of other cytokines – such as IL-6 and TNF- α – were measured simultaneously with IL-1β, we could make more comprehensive conclusion and comment. On the other hand, there are some studies reporting that changes of inflammatory or anti-inflammatory cytokines following one-session exercise tests are subject to balance of negative energy or energy cost exceeding 800 kg due to exercise activity [15]. As a research history in this concern is not available, it seems rather difficult to make a general comment on the sole finding of the study. Therefore, emphasis is placed on conducting further studies in this field.

## REFERENCES

1. Maedler, K. Dharmadhikari, G. Schumann, D.M. Størling, J. (2009). Interleukin-1 beta targeted therapy for type 2 diabetes. Expert Opin Biol Ther. 9(9):1177-88.
2. Manica-Cattani, M.F. Bittencourt, L. Rocha, M.I. Algarve, T.D. Bodanese, L.C. Rech, R. Machado, M.M. (2009). Association between interleukin-1 beta polymorphism (+3953) and obesity. Mol Cell Endocrinol. 314(1): 84-9.
3. Kathrin, M. Gitanjali, D. Desiree, M. (2009). Interleukin-1 beta targeted therapy for type 2 diabetes. Expert Opin. Biol. Ther. 9(9): 1177-1188.

4. Urboniene, D. Sakalauskas, R. Sitkauskiene, B. (2008). C-reactive protein levels in patients with chronic obstructive pulmonary disease and asthma. Medicina (Kaunas). 44(11): 833-40.
5. Guler, N. Kirerleri, E. Ones, U. Tamay, Z. Salmayenli, N. Darendeliler, F. (2004). Leptin: does it have any role in childhood asthma? J Allergy Clin Immunol. 114(2): 254-9.
6. Saltevo, J. Vanhala, M. Kautiainen, H. Laakso, M. (2007). Levels of adiponectin, C-reactive protein and interleukin-1 receptor antagonist are associated with the relative change in body mass index between childhood and adulthood. Diab Vasc Dis Res. 4(4): 328-31.
7. Takizawa, H. (1998). Cytokines/chemokines and adhesion molecules in local inflammatory responses of the lung. Drug News Perspect. 11(10): 611-9.
8. Hammett, C.J. Prapavessis, H. Baldi, J.C. Varo, N. Schoenbeck, U. Ameratunga, R. (2006). Effects of exercise training on 5 inflammatory markers associated with cardiovascular risk. Am Heart J. 151(2): 367.e7-367.e16.
9. Bonyadi, M. Badalzadeh, R. Mohammadi, M. Poozesh, S. Salehi, I. (2009). The effect of regular training on plasma cytokines response in healthy and diabetic rats. Saudi Med J. 30(11): 1390-4.
10. Larochelle, J. Freiler, J. Dice, J. Hagan, L. (2007). Plasma resistin levels in asthmatics as a marker of disease state. J Asthma. 44(7): 509-13.
11. Hojati, Z. Rahmaninia, F. Soltani, B. Rahnama, N. (2008). Acute effects of aerobic and resistance exercise on leptin levels and coronary heart disease risk factors in obese girls. Olympics. 16(2 (SERIAL 42): 7-17.
12. Tsao, T.H. Hsu, C.H. Yang, C.B. Liou, T.L. (2009). The effect of exercise intensity on serum leptin and Creactive protein levels. J Exerc Sci Fit 7(2): 98-103.
13. Ju¨rima¨e J, Ju¨rima¨e T. (2005). Leptin responses to short term exercise in college level male rowers. Br J Sports Med. 39: 6–9.
14. Olive, J.L. Miller, G.D. (2001). Differential effects of maximal- and moderate-intensity runs on plasma leptin in healthy trained subjects. Nutrition 17: 365–9.
15. Bouassida, A. Chamari, K. Zaouali, M. Feki, Y. Zbidi, A. Tabka, Z. (2010). Review on leptin and adiponectin responses and adaptations to acute and chronic exercise. Br J Sports Med. 44(9): 620-30.