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ORIGINAL ARTICLE

Serum C Reactive Protein in Obesity and its Response to one Moderate Exercise in Obese Men

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ABSTRACT
According to the population studies, it is now clear that obesity is associated with systemic inflammation. The objective of this study was to determine whether serum C reactive protein (CRP) concentration is associated with body weight or abdominal circumference in obese men and to evaluate serum CRP response to on exercise test in these subjects. For these purpose, serum CRP were measured before and after one moderate exercise included 40 min running text in fifteen sedentary healthy obese men aged 39 ± 2 year and body mass index 31.5 ± 1.21 kg/m2. The correlations between variables were determined using the bivariate correlation test. Paired T test was used to determine the mean differences between pre and post-exercise values of CRP. Based on Pearson's correlation coefficients, serum CRP was positive correlated with body weight (ρ =0.028, r=0.56) and abdominal obesity (ρ =0.036, r=0.48) in studied subjects at baseline. Exercise test resulted significant decrease in serum CRP when compared with pre exercise ρ=0.000). These finding supports the key role of systemic inflammation in obesity and related diseases. In addition, it should be noted that one exercise test has an acute inflammatory property in non-trained obese subjects.
Keywords: *Inflammation, Obesity, Acute exercise, Sedentary.*

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INTRODUCTION

The protein or peptides secreted by adipose tissue such as leptin, adiponectin, resistin, and some interleukins have some complex performances such as affecting fat or carbohydrate metabolism, energy homeostasis and some factors affecting prevalence of chronic diseases such as insulin resistance or lipid disorders [1]. Among protein secreted by adipose tissue, C - reactive protein (CRP) is a key pro-inflammatory cytokine which is generated in response to acute infection or inflammation, and its plasma concentration can increase up to 1000 times in response to an injury or infection [2]. A growing body of literature suggests that CRP is a more appropriate marker as compared to other cytokines in predicting cardiovascular diseases [3]. Some scientific sources also revealed that CRP together with age, hypertension, and diabetes are of the major factors related to cardiovascular diseases of this population [4].

Nowadays, researchers of health sciences focus on providing appropriate approaches to improve inflammatory profile in susceptible people or diseased population. Meanwhile, the role of exercise as a non-pharmaceutical factor to maintain balance of inflammatory mediators among healthy and diseased populations was studied several times; contradictory findings are found on response of these factors to exercise among healthy and/or diseased people. In non-trained or sedentary individuals, CRP basic levels are increased due to mechanisms such as increasing stress oxidative or decreasing insulin sensitivity [5]. There are contradictory studies of the effect of exercise on CRP levels, as some studies did not report any changes at its levels following long-term exercise programs [6]. Studies on elderly people or cardiovascular patients reported the role of exercise intervention as an anti-inflammatory factor [7], as 6 months exercise training for 2 to 3 sessions weekly on cardiovascular patients led to significant reduction of serum CRP levels [8]. However, other studies reported no change of its levels following long-term exercise programs [9]. In spite of the contradictory findings on response of this inflammatory cytokine to long-term programs, limited studies were carried out on whether its serum levels are affected by short-term or one session exercise test. With respect to the limitations of the studies on acute response of CRP to exercises, the present study investigated the effect of a relatively short session of running test on serum CRP levels in inactive adult males.

RESEARCH DESIGN AND METHODS

Subject characteristics: Participants included thirteen healthy non-trained adult males aged 39 ± 2 year that participated in this study by accessible sampling . Written consent was obtained from each subject after the experimental procedures and possible risks and benefits were clearly explained. Obesity was main inclusion criteria. Participants were non-athletes, non-smokers and non-alcoholics. Participants were included if they had not been involved in regular physical activity/diet in the previous 6 months. None of the subjects used drugs or therapies for obesity. We also excluded people who had any self reported physician diagnosed chronic disease such as arthritis, stroke, and diabetes.

Anthropometrics Markers: Waist-to-hip ratio, weight, height and BMI were measured. All anthropometric measurements were made by the same trained general physician and under the supervision of the same pediatrician following standard protocols. Body weight was measured in duplicate in the morning following a 12-h fast. Height was measured with high precision with an error of ± 0.1 cm. The Body Mass index (BMI) was calculated using the formula body weight/height2 in terms of kg/m^2. Waist circumference (WC) was measured with a non-elastic tape at a point midway between the lower border of the rib cage and the iliac crest at the end of normal expiration. Hip circumference was obtained at the level of largest diameter below the anterior iliac crest.

Laboratory Analyses and exercise: Venous blood samples were obtained before and immediately after exercise test. Exercise test lasted 40 min running at 60(%) of maximal heart rate on smooth surface with no slope. Run conditions were the same for all participants. Blood samples used for measuring serum CRP. Blood samples were dispensed into EDTA-coated tubes and centrifuged in order to separate serum. Serum CRP concentration was determined using Eliza method [Diagnostics Biochem Canada Inc. High sensitivity C - reactive protein (Hs-CRP), Canada]. The Intra- assay and inter-assay coefficient of variation and sensitivity of the method were 15.2%, 9.9% and 0.3 ng/mL respectively.

Statistical Methods: All analyses in the statistical evaluation were carried out with SPSS-13.0 software. Normal distribution of data was analyzed by the Kolmogorov-Smirnov normality test. Pearson's correlation coefficients were used to evaluate the correlations between serum CRP with body weight, abdominal obesity and other anthropometrical markers. The differences between the groups were considered to be significant at a p-value of ≤ 0.05.

RESULTS

Anthropometric characteristics of the study participants are shown in Table 1. A positive correlation was found between serum CRP and body weight at baseline (p=0.028, r=0.56, Fig 1). Serum CRP was also positive significant correlated with abdominal obesity in studied subjects (p=0.036, r=0.48, Fig 2). Based on Paired T test, exercise test resulted significant decrease in serum CRP when compared with pre exercise (from 2458 (936) to 3128 (720) ng/ml, p=0.000, Fig 3).

Table 1: The descriptive anthropometric features of studied subjects

Variables	**Age** (years)	**Weight** (kg)	**Height** (cm)	**BMI** (kg/m^2)	**BF (%)**	**AC** (cm)	**HC** (cm)	**WHO**
M ± SD	**39** *(2.11)*	**94** *(6.7)*	**172** *(4.7)*	**31.5** *(1.21)*	**32.8** *(1.25)*	**104** *(3.8)*	**103** *(4.7)*	**1.01** *(0.18)*

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

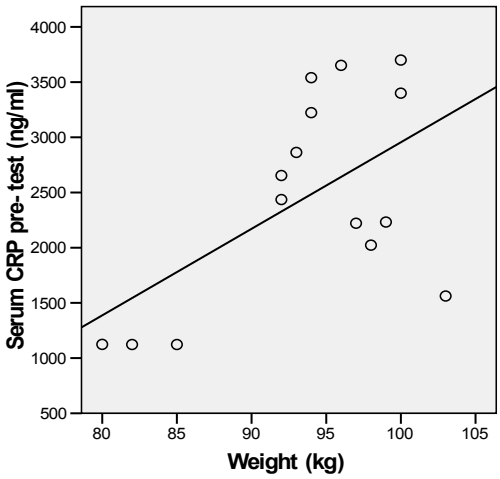

Fig 1; Correlation between serum CRP and Body weight in studied subjects. A significantly positive correlation was found between CRP and Body weight.

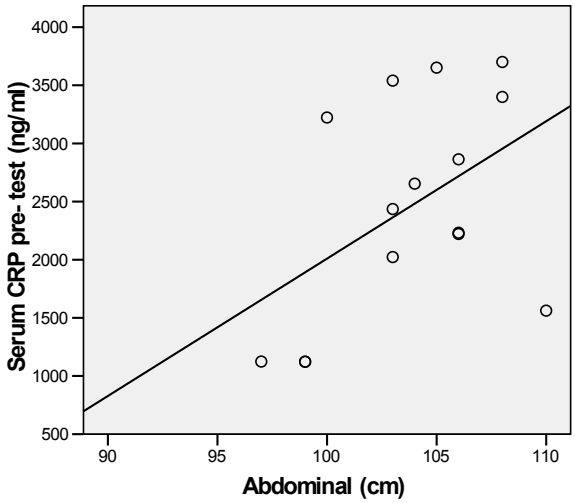

Fig 2; Correlation between serum CRP and abdominal circumference in studied subjects. A significantly positive correlation was found between them.

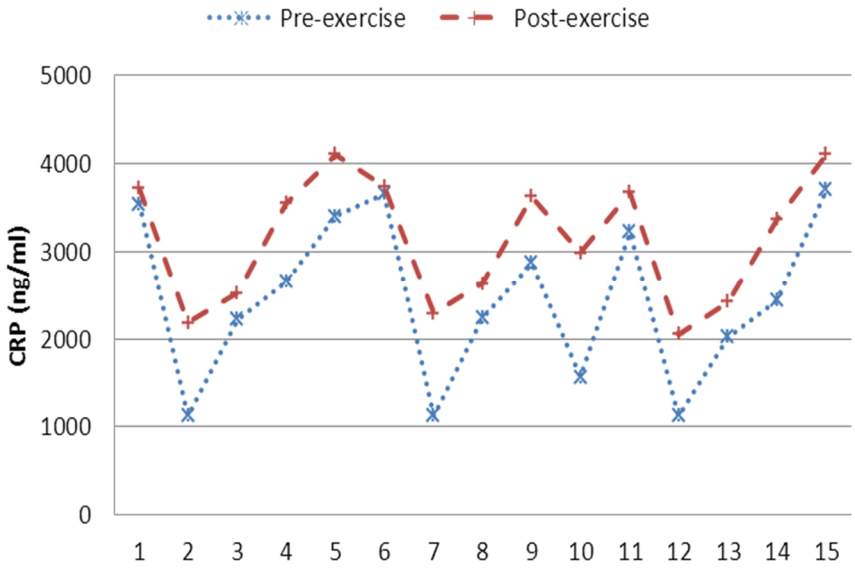

Fig 3; The changes pattern of serum CRP at pre and post test of studied subjects. Exercise test resulted in significant decrease in serum CRP when compared with pre test.

DISCUSSION

In addition to the limited and contradictory studies on the acute response of other adipocytokines, there is insufficient information in this concern on CRP, as another inflammatory cytokines that is sometimes known as the major risk factor of cardiovascular diseases [10]. The major finding of this research was the significant increase of CRP serum levels following the exercise test. In fact, one 40-min running session with relatively moderate intensity led to the significant increase of serum CRP in the obese non-athletic males. In accordance with more previous study, our results were showed a significant correlation in serum CRP with anthropometrical index such as body weight and abdominal obesity.

Today, it is believed that exercise activities lead to prevention and reduction of inflammatory diseases due to balancing levels of some cytokines such as CRP [11, 12]. However, it is better to specify type of exercise, which is practiced to reduce inflammation among healthy or patient and elderly population, before drawing any conclusion; as it was specified that responses of inflammatory and non-inflammatory cytokines, especially at CRP levels, are different from one exercise to another or among different populations. In this concern, it was almost proved that in case regular long-term exercises program lead to reduction of body fat levels and body weight with the rates exceeding 5 percent, it will lead to the significant improvement of cytokines and CRP is no exception [13].

In spite of the limited studies, great variety was seen on the acute responses of such inflammatory cytokines to short-term exercise activities or one-session exercise tests. In this concern, it was proved that 6 and 12 months

of regular physical exercise follows significant reduction of CRP serum levels [14]. However, a study proved that a one-session exercise activity with intensity of 65 percent of maximum heart rates does not lead to a significant change at CRP levels in obese females and males [15].

Such findings were reported while other study reported significant increase of CRP following an exercise test in the form of a long-term intense running and/or a session of non-aerobic exercise [16]. Findings of the study typically refer to inflammatory characteristic of aerobic or non-aerobic exercise tests on CRP levels. To confirm this, findings of the relevant study indicate inflammatory feature of the relevant exercise test on CRP serum levels, as its serum levels was increased significantly in proportion to the basic levels immediately after the exercise test. One of the major reasons for its significance increase following the exercise test was inactiveness or low preparedness level of the population under study within the period before the study.

It is also rational to state that in case exercise test expands inflammation conditions in body, it will follow increase of CRP levels [17], as the study of Cao et al. showed significant increase of CRP levels following a session of aerobic exercise with intensities of 65 and 85 percent of VO2max. The increase rate was reported in further exercise intensities [18]. Therefore, in addition to the internal and environmental factors, researchers introduced exercise intensity as the major factor affecting changing CRP levels following exercise tests. On the other hand, the increase of CRP response with an emphasis on acute response to exercise test might be attributed to changes of blood plasma volume while doing the exercises. In case an exercise test follows plasma volume reduction, increase of CRP levels might be attributed to plasma volume reduction. It is stated here that lack of measuring plasma volume before and after the exercise test is one of the limitations of the present study. However, it should be noted that there are contradictory opinions on changes of plasma volume at the time of an exercise test, as some studies reported plasma volume reduction [19] and others lack of plasma volume change [18] following an exercise test; of course, it depends on duration and intensity of an exercise.

Reviewing the relevant findings with an emphasis on the increase of CRP in response to some exercise tests indicate that this inflammatory cytokine is known as one of the most sensitive and important cardiovascular risk factors. In response to stresses or exercise tests, it seems that its levels in blood circulation are subjected to the changes far more than the ones of other inflammatory cytokines, as some researchers stated that CRP plasma concentration increases to 1000 times in response to an injury, infection or other stressors [2]. It is performed in a way that it is changed even with minimum inflammatory stresses or exercise tests with different intensities. On the other hand, according to the results of the present study and conclusion of the earlier studies, it seems that serum levels decrease in response to long-time regular exercise programs that often follow body weight reduction rather than one-session short-term heavy exercises tests.

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REFERENCES

1. Fasshauer. M. Klein, J. Lossner, U. Paschke, R. (2003). Interleukin (IL)-6 mRNA expression is stimulated by insulin, isoproterenol, tumour necrosis factor α, growth hormone, and IL-6 in 3T3–L1 adipocytes. Horm Metab Res. 35: 147–152.
2. Schultz, D.R. Arnold, P.I. (1990). Properties of four acute phase proteins: C-reactive protein, serum amyloid a protein, a1-acid glycoprotein and fibrinogen. Semin Arthritis Rheum. 20: 129–47.
3. Nicklas, B.J. You, T. Pahor, M. (2005). Behavioural treatments for chronic systemic inflammation: effects of dietary weight loss and exercise training. CMAJ. 172: 1199–209.
4. Panagiotakos, D.B. Pitsavos, C. Chrysohoou, C. Skoumas, E. Stefanadis, C. (2008). Five-year incidence of cardiovascular disease and its predictors in Greece: the ATTICA study. Vasc Med. 13: 113–21.
5. Pedersen, B.K. (2006). The anti-inflammatory effect of exercise: its role in diabetes and cardiovascular disease control. Essays Biochem. 42: 105–117.
6. Kim, S.K. Jung, I. Kim, J.H. (2008). Exercise reduces C-reactive protein and improves physical function in automotive workers with low back pain. J Occup Rehabil. 18: 218–22.
7. Julia, W. Karen, C. Javier, R. (2010). Ascension M. Role of physical activity on immune function Physical activity, exercise and low-grade systemic inflammation. Proceedings of the Nutrition Society. 69: 400–406.
8. Smith, J.K. Dykes, R. Douglas, J.E. (1999). Long-term exercise and atherogenic activity of blood mononuclear cells in persons at risk of developing ischemic heart disease. JAMA. 281: 1722–1727.
9. Campbell, K.L. Campbell, P.T. Urich, C.M. Wener, M. Alfano, C.M. Foster-Schubert, K. Rudolph, R.E. Potter, J.D. (2008). No reduction in C-reactive protein following a 12-month randomized controlled trial of exercise in men and women. Cancer Epidemiol Biomarkers Prev. 17: 1714–8.
10. Tice, J.A. (2003). The relation of C-reactive protein levels to total and cardiovascular mortality in older U.S . women. Am J Med. 114: 199–205.
11. Das, U.N. Fams, M.D. (2001). Is obesity an inflammatory condition? Nutrition. 17(11-12): 953-966.
12. LaMonte, M.J. Durstine, J.L. Yanowitz, F.G. Lim, T. DuBose, K.D. Davis, P. (2002). Cardiorespiratory fitness and C-reactive protein among a tri-ethnic sample of women. Circulation. (106): 403- 406.
13. Varady, K.A. Tussing, L. Bhutani, S. Braunschweig, C.L. (2009). Degree of weight loss required to improve adipokine concentrations and decrease fat cell size in severely obese women. Metabolism. 58(8): 1096-101.
14. Hammet, C.J.K. Prapavessis, H. Baldi, 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. 7-367. 16.
15. Semple, S.J. (2006). C-reactive protein-biological functions, cardiovascular disease and physical exercise. SAJSM. 18(1): 24-28.

16. 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.
17. Hosseini-Kakhk, S.A.R. Khademosharie, M. Amiri-Parsa, T. Davarzani, Z. (2012). Response of Leptin and C - reactive protein to a Single Session Circuit Resistance Exercise in Over-weight Girl Student. Ofogh-e-Danesh; Journal of Gonabad University of Medical Sciences. 18(3): 11.
18. 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.
19. Ferguson, M.A. White, L.J. McCoy, S. Kim, H.W. Petty, T. Wilsey, J. (2004). Plasma adiponectin response to acute exercise in healthy subjects. J Appl Physiol. 91(2-3): 324-329.