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High sensitive C - reactive protein and lipid profiles in obese or overweight women

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Abstract

Accumulating evidence indicates that obesity is associated with increased proinflammatory cytokines. The objective of this investigation was to determine Serum CRP in relation to lipid profile markers in obese or overweight women. Twenty one non-trained adult obese or overweight women aged 28-46 year was participated in this study by accessible samples. Fasting serum CRP, triglyceride (TG), total cholesterol (TC), Low density lipoprotein (LDL) and High density lipoprotein (HDL) were measured in all subjects. Pearson correlations methods were calculated to determine the relations of serum CRP with lipid profile markers. Fasting serum CRP was negatively correlated with HDL ($p = 0.012$, $r = 0.54$) and positively correlated with LDL ($p = 0.035$, $r = 0.46$) and no correlation with TG ($p = 0.63$, $r = 0.112$) and TC ($p = 0.22$, $r = 0.137$). These data suggest that CRP can be a precise marker of cardiovascular disorder in obese or overweight women.

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Introduction

Those proteins the quantities of which vary in plasma and serum of humans and warm-blooded animals under the influence of factors such as inflammation, necrosis, bacterial and viral infections and malignancies are called acute phase proteins. Among them, C-reactive protein is a key inflammatory factor produced by the liver in response to acute infection or inflammation. Its normal value is about 3.5 mg, but its plasma concentration increases up to 1000 times in response to injury or infection (Schultz *et al.*, 1990). This inflammatory cytokine is mainly synthesized by the liver ducts and is regulated by IL1B, IL-6 and TNFα. Recently CRP has been identified as a more appropriate indicator than other cytokines in predicting CVD (Nicklas *et al.*, 2005). The presence of C-reactive protein in serum is associated with diagnosis of many infections, malignancies and inflammatory diseases, particularly heart attacks and measurement of serum levels of this inflammatory cytokine can help to determine the intensity of diseases. However, measuring the CRP at various intervals can control the treatment process and find out whether a diet is effective or not. Most recent studies consider measurement of CRP the only factor for indentifying inflammation, however it has frequently been mentioned that measuring other inflammatory markers along with CRP provides better information about the mechanisms involved in inflammation (Julia *et al.*, 2010).

It is clear that the increase in plasma CRP is associated with coronary artery disease, obesity, diabetes, smoking and sedentary lifestyle (Bruun *et al.*, 2003). These studies have somehow supported increase of CRP in presence of overweight or obesity (Chiu *et al.*, 2012).

On the other hand, increased levels of cardiovascular risk factors - such as triglyceride, Total cholesterol, LDL lipoprotein cholesterol and decreased levels of HDL lipoprotein cholesterol in obese populations or diseases related to obesity and metabolic syndrome has been reported repeatedly (Chiu *et al.*, 2012). However the relationship between levels CRP and lipid profile parameters has been studied in ill population, but the relationship between them in obese or overweighed women is less frequently studied. Hence, this study aims to determine the association between indicators of lipid profile and levels of CRP in obese or overweighed women.

Research methods and procedures

Study population and design

Participants included twenty one non-trained healthy obese or overweight women (aged 38.29 ± 7.74 years, body weight 83.3 ± 10.31 kg) participated in this study by accessible samples. Participants were included if they had not been involved in regular physical activity/diet in the previous 6 months. Participants were non-smokers and non pregnancy. A detailed history and physical examination of each subject was carried out. The range of Body mass index of the subjects was 26-36 kg/m2. Subjects with diagnosed type 2 diabetes, having history of known hyperlipidemia, coronary artery disease, peripheral artery disease, using medicine or hormone preparations that affect the carbohydrate and lipid metabolism were excluded.

Anthropometrical measurements

Anthropometric measurements of height, weight, percent body fat, and circumference measurements were taken in the physiology laboratory. Weight was measured to the nearest 100 g using digital scales. Standing height was measured to the nearest 0.1 cm with the use of a wall-mounted stadiometer. The BMI was calculated as the weight in kilograms divided by the square of the height in meters. The abdominal circumference was measured to the nearest 0.1 cm, using a non-extendable flexible tape applied above the iliac crest and parallel to the ground; with the subject standing erect with abdomen relaxed, arms along the body, and feet together. Hip circumference was measured at the maximum circumference between the iliac crest and the crotch while the participant was standing and was recorded to the nearest 0.1 cm. Percentage of body fat was estimated by bioelectrical impedance method (Omron Body Fat Analyzer, Finland).

Laboratory Assays

Fasting blood CRP (serum), glucose (FBG), total cholesterol, triglyceride, High Density Lipoprotein cholesterol and LDL lipoprotein cholesterol levels of all the participants were studied in the morning between 08.00–10.00 after 12 hours of fasting. All participants refrained from any severe physical activity 48 h before measurements.Glucose was determined by the oxidase method (Pars Azmoon kit, Tehran). Serum CRP and insulin were determined by ELISA method. Triglyceride, total cholesterol, HDL and LDL-cholesterol was measured directly with enzymatic methods (Randox direct kits) using Kobas Mira auto-analyzer made in Germany.

Data analysis

Statistical analysis was performed with the SPSS software version 15.0. All values are represented as mean ± SD. The Kolmogorov-Smirnov test was applied to determine the variables with normal distribution. Pearson correlation method used to determine the relationship between serums CRP with lipid profiles studied subjects. All statistical tests were performed and considered significant at a $P \leq 0.05$.

Results

Data of descriptive statistics showed that mean and standard deviation of anthropometrical markers in studied subjects was age 38.29 ± 7.74 years, height 160.95 ± 5.61 cm, weight 83.3 ± 10.31 kg, abdominal obesity 110 ± 10, Hip circumference 113.7 ± 8.58, BMI 32.18 ± 7.74 kg/m2 and body fat (%) 44.76 ± 4.29. clinical markers were also showed in table 1.

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

Variables	TC (mg/dl)	TG (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	Serum CRP (ng/dl)
M ± SD	171 ± 31	124 ± 76	43.9 ± 13.7	109 ± 24	5928 ± 3037

However, the relationship between serum CRP with lipid profile indicators such as triglyceride ($p = 0.63$, $r = 0.112$) and total cholesterol ($p = 0.22$, $r = 0.137$) was not significant. But, our finding showed that adiponectin has a high negative correlation with HDL cholesterol ($p = 0.012$, $r = 0.54$, Fig 1) and positive correlation with LDL cholesterol ($p = 0.035$, $r = 0.46$, Fig 2).

Discussion

A negative significant correlation of CRP with HDL in obese or overweight women is one the main findings of this study. The serum CRP levels in the study population also have a direct and significant correlation with LDL. These findings somehow support a close relationship between CRP as an inflammatory marker with indicators of lipid profile, all of which are the risk factors for cardiovascular disease; although the relationship of CRP with TG and TC as the two other markers of lipid profile was not significant but it followed a linear pattern.

The incidence of cardiovascular disease is much lower in younger women than in men (Shilpa *et al.*, 2011). CRP is associated with indices of obesity and cardiovascular disease (Chiu *et al.*, 2012).

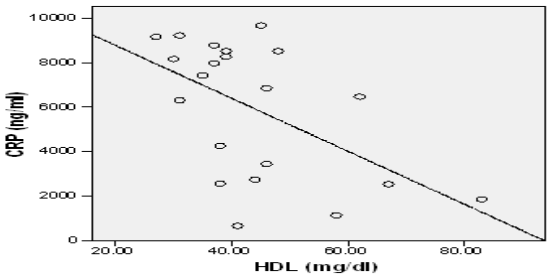

Fig. 1. This fig shows a significant negative correlation between Serum CRP and HDL lipoprotein in studied subjects.

Accumulating evidence indicates that inflammation plays a key role in accentuating the formation of atherosclerotic plaque, and thus the measurement of inflammatory markers provide a method of assessing cardiovascular risk (Pfützner *et al.*, 2006). Numerous studies as well as a narrative review have reported that Obesity has been linked to CRP (Brooks *et al.*, 2010). It has recently been recognized that varying degrees of association between obesity and

CRP is dependant to sex, ethnicity and age (Choi *et al.*, 2013).

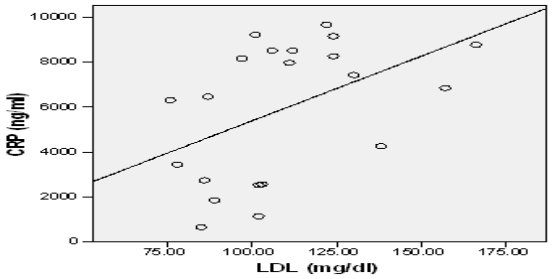

Fig. 2. This fig shows a significant positive correlation between Serum CRP and LDL lipoprotein in studied subjects.

CRP is an inflammatory parameter of cardiovascular disease and its elevated levels are associated with increased risk of other cardiac diseases such as future coronary heart disease (Jialal *et al.*, 2003; Ridker *et al.*, 2003). On the other hand, it has been long known that obesity is one of the strongest determinants of CRP levels (Visser *et al.*, 1999). Although CRP was to be only a marker of vascular inflammation in previous studies, recent research suggest that it also plays an important role in atherogenesis (Tchernof *et al.*, 2002). Data from a observational study indicate that this inflammatory cytokine is a highly conserved plasma protein that participates in the systemic response to inflammation and there is considerable evidence that it is an excellent biomarker for acute-phase response and has proved to be an important and characteristic predictor of future cardiovascular disease and metabolic abnormalities in overtly seen healthy men and women (Carlson *et al.*, 2005). On the other hand, according to the population studies, it has been indicated that increased levels of low-Density lipoprotein, triglycerides, total cholesterol and decreased levels of high density lipoprotein are associated with atherosclerosis that may lead to predisposition to other acute coronary syndromes (Graham, 2007). Data of a recent study support a strong significant positive correlation of total cholesterol and triglycerides with HSCRP and a negative correlation of HDL with the same (Chiu *et al.*, 2012).

Scientific resources consider both CRP and lipid profile parameters as key indicators of cardiovascular disease and propose concomitant measurements of them in order to identify cardiovascular function. The correlation of CRP with TG and TC as indices of lipid profile was not significant, but confirming the findings of some previous studies (Chiu *et al.*, 2012) our findings support the significant and strong correlation of thus inflammatory cytokine with HDL and LDL as two strong markers for detection of cardiovascular disease. However, absence of a significant relationship between CRP with TG and TC may be attributed to the low number of samples studied. But the presence of a very close relationship of this inflammatory cytokine with HDL and LDL is important even with a small number of samples.

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