

## Serum C reactive protein levels in metabolic syndrome

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**Abstract:** CRP is a major acute phase protein it is a very sensitive marker of tissue damage and tissue inflammation. Recent evidences have shown that CRP levels increases in metabolic syndrome, with this background we in the present study tried to evaluate the levels of CRP in subjects with metabolic syndrome. The study was conducted in the Department of Biochemistry Rajiv Gandhi Institute of Medical Sciences, [RIMS] Adilabad. The study involved 50 adult male aged 30-45 yrs, they were divided into two groups, Group I [test group] (n=25) The Group II [control group] (n=25) included normal age and sex matched patients serving as controls. 10 ml of blood was withdrawn from the large peripheral vein in a container for biochemical evaluation. Blood sugar estimation was done and from the remaining sample serum was separated by centrifugation and stored at a temperature of 4-8°C till the tests were done that included Serum Uric acid, Triglycerides, and hs-CRP. The mean BMI of Group I was  $29.84 \pm 1.86$  and  $22.9 \pm 1.23$ , the p value was found to be significant. In order to determine abdominal obesity, we used Waist Hip Ratio [WHpR], with a value of above 0.9 was considered as the marker of abdominal obesity. The Group I had mean values of [WHpR] was  $1.0 \pm 0.09$  and the Group II was  $0.84 \pm 0.03$ . The mean blood sugar levels determined found in Group I was  $114.56 \pm 10.39$  and Group II was  $86.24 \pm 6.74$ , the p values in both groups were found to be significant. Similarly, the serum triglyceride levels in Group I was  $181.96 \pm 11.3$  and Group II  $4.9 \pm 0.57$ , High Sensitive C reactive protein hs-CRP was  $6.06 \pm 0.61$  in Group I and  $2.19 \pm 0.27$  the p value was found to be significant. In the present study we found that CRP levels were significantly increased in the subjects with metabolic syndrome. Low-grade inflammatory markers like CRP are important parameters in the prediction of risk for development of insulin resistance and obesity. In fact the relation of CRP with metabolic syndrome is like a chain reaction one leads to increase in the other, thus leading to the formation of vicious cycle. Therefore levels CRP can predict the future development of metabolic syndrome and cardiovascular risk in this group of the population.

**Keywords:** C Reactive Protein [CRP], metabolic syndrome [MS]

### INTRODUCTION

Metabolic syndrome has become important topic research in recent years. The physiologic and biochemical abnormalities of the metabolic syndrome are now being considered as important risk factors for cardiovascular diseases and diabetes mellitus. C Reactive Protein production is a part of non-specific acute-phase response to most forms of inflammation, infection and tissue damage [1]. Although CRP values are not diagnostic on their own it can provide important information on the conditions inside the body. CRP was named so because of its capacity to precipitate the somatic C-polysaccharide of *Streptococcus pneumoniae*. It was the first acute phase protein to be described as an important marker of inflammation and tissue damage

[2]. The acute phase response comprises of the nonspecific physiological and biochemical responses of animals to tissue damage, infection, inflammation and malignant neoplasia. The pathological process involved is the release of cytokines from the damaged cells which increases the synthesis of a number of proteins by the hepatocytes [1]. Among the components of metabolic syndrome the measures of inflammation are important such as C-reactive protein [3-5] CRP is a pattern recognition molecule binding to specific molecular configurations that are typically exposed during cell death or found on the surfaces of pathogens. It generally tends to increase rapidly within hours after tissue injury or infection suggesting a probable role in host defense [6]. The CRP gene is located on the short

arm of chromosome 1, the induction of CRP in hepatocytes is principally regulated at the transcriptional level by cytokine interleukin-6 which can be enhanced by interleukin-1 [7]. Both IL-6 and IL-1 control the expression of many acute phase proteins genes through activation of transcription factors [8]. CRP levels under 3 and circulating CRP levels under 10g/ml have been regarded as clinically insignificant. However, in recent years, several studies have demonstrated the association between slightly elevated CRP plasma levels between 3 and 10g/ml and risk of developing cardiovascular disease. We in the present study tried to evaluate the levels of CRP in individuals with metabolic syndrome in this group of population.

**MATERIALS AND METHODS**

The study was conducted in the Department of Biochemistry Rajiv Gandhi Institute of Medical Sciences [RIMS] Adilabad. The clearance and permission for the study were obtained Institutional Ethical committee. Informed consent was obtained from all the patients participating in the study. The study involved 50 adults male aged 30-45 yrs, they were divided into two groups, Group I [test group] (n=25), it included patients having metabolic syndrome [To define metabolic syndrome among the participants the criteria used was according to the Third report of National Cholesterol Education Program Expert Panel on detection, Evaluation and treatment of High BP Cholesterol in Adults (NCEP/ATP III) [9].

The Group II [control group] (n=25) included normal age and sex matched patients serving as controls. All Subjects with chronic infective or inflammatory disorders were excluded from the study as these conditions can affect the outcome of the study. About 10 ml of blood was withdrawn from the large peripheral vein in a container for biochemical evaluation. Blood sugar estimation was done and from the remaining sample serum was separated by centrifugation and stored at a temperature of 4-8°C till

the tests were done that included Serum Uric acid, Triglycerides, and hs-CRP. We in the study used Diazyme High Sensitivity C-Reactive Protein (hs-CRP) Assay quantitative determination of C-reactive protein (CRP) in human serum and plasma on ERBA chem-7 [ERBA Diagnostics Mannheim GmbH Germany], a fully automated clinical chemistry analyzer. The diazyme high sensitive CRP assay has a linear range of 0.20 - 20mg/L. The assay is based on a latex-enhanced turbidimetric immunoassay method. An antigen-antibody reaction occurs between CRP in a sample and anti-CRP antibody which has been sensitized to latex particles, agglutination results. This agglutination is detected as an absorbance change (570 nm), with the magnitude of the change is proportional to the quantity of CRP in the sample. The actual concentration is then determined by interpolation from a calibration curve prepared from calibrators of known concentration. The data was recorded and entered in MS word Excel format and analyzed using SPSS 17.

**RESULTS**

The mean age group of Group I patients was 35.6 ± 6.39 and mean age group of Group II was 36.4 ± 5.1. The mean BMI of group I was 29.84 ± 1.86 and 22.9 ± 1.23, the p value was found to be significant. In order to determine abdominal obesity, we used Waist Hip Ratio [WHpR], with a value of above 0.9 was considered as the marker of abdominal obesity. The Group I had mean values of [WHpR] was 1.0 ± 0.09 and the group II was 0.84 ± 0.03. The mean blood sugar levels determined found in Group I was 114.56 ± 10.39 and Group II was 86.24 ± 6.74, the p values in both groups were found to be significant.

Similarly, the serum triglyceride levels in Group I was 181.96 ± 11.3 and Group II 4.9 ± 0.57 and High Sensitive C reactive protein hs-CRP was 6.06 ± 0.61 in Group I and 2.19 ± 0.27 the p value was found to be significant see table 1.

**Table-1: comparison of Mean levels of all parameters in Group I and Group II**

Characteristic	Group I [Test]	Group II [Control]	P values
Age in years	35.6 ± 6.39	36.4 ± 5.1	> 0.1 NS
BMI	29.84 ± 1.86	22.9 ± 1.23	< 0.05*
WHpR	1.0 ± 0.09	0.84 ± 0.03	> 0.1
Blood Sugar Levels mg/dl	114.56 ± 10.39	86.24 ± 6.74	< 0.05*
Serum Triglyceride Levels mg/dl	181.96 ± 11.3	137 ± 11.4	> 0.1
Serum uric acid levels mg/dl	7.67 ± 0.74	4.9 ± 0.57	<0.05*
hs-CRP mg/L	6.06 ± 0.61	2.19 ± 0.27	<0.05*

\* Significant

**DISCUSSION**

In the present study, we found a strong positive correlation of BMI with CRP the association was significant. CRP was compared with diabetes and uric acid levels the p values were found to be

significant. Metabolic Syndrome constitutes a cluster of simultaneously occurring features; therefore, it may be difficult to isolate the single variable cause of increase in CRP in metabolic syndrome. In the present study, we found the CRP levels thrice as high as in Normal

subjects. In a study by Danish J *et al.* In individuals without history of CHD a significant association of CRP with obesity was demonstrated but no association was found with other components of MS [10]. D.E. Laaksonen1 *et al.* found in the population based prospective cohort study with 11 years follow up that low-grade inflammation as a common factor leading to development of metabolic syndrome, diabetes, and cardiovascular disease [11]. Metabolic syndrome was found to occur more in Non-diabetic men with CRP levels of more than 3 mg/l. There is a positive association between baseline CRP concentration and BMI [4, 9] and weight loss lowers the CRP values. Raised base line CRP associated with insulin resistance and metabolic syndrome [12, 13]. It is seen that the adipose tissue is a major source of pro-inflammatory cytokines such as IL-6 and TNF and factors relating to insulin resistance also suggests that inflammation is an integral part of the disturbances in insulin, glucose and lipid metabolism [10] CRP production alone predicts the development of type 2 diabetes independently of other traditional risk factors [14].

Several studies in vitro and human subjects have suggested mechanisms by which low-grade inflammation may increase insulin resistance and dyslipidemia and endothelial dysfunction [15-18]. Inflammatory markers like white blood cells count and fibrinogen has also been linked to weight gain and a key triggering factor of the metabolic syndrome in a three year follow up of the atherosclerosis risk in the cohort [19]. Physical exercise and moderate alcohol consumption are both associated with lowering the base-line CRP values [20, 21]. In the present study, we found that the serum triglycerides and uric acid levels were significantly elevated in subjects with metabolic syndrome. Tanya Keenan *et al.*; in a study comparing the relation of uric acid to serum levels of hs-CRP, triglycerides and high density lipoprotein cholesterol and hepatic steatosis found that the High uric acid levels were associated with increased Triglyceride to HDL independently of metabolic syndrome and obesity they suggested that the link between Uric Acid levels and cardiovascular risk precedes metabolic syndrome [22]. It is shown that the uric acid amplifies oxidative stresses in adipocytes by increasing monocyte chemotactic protein-1 and decreasing adiponectin [23]. This pro-oxidative action accelerates the adipose formation and contributes to insulin resistance [24, 25].

## CONCLUSION

In the present study, we found that CRP levels were significantly increased in the subjects with metabolic syndrome. Low-grade inflammatory markers like CRP are important parameters in the prediction of risk for development of insulin resistance and obesity. In fact, the relation of CRP with metabolic syndrome is like a chain reaction one leads to increase in the other,

thus leading to the formation of the vicious cycle. Therefore levels CRP can predict the future development of metabolic syndrome and cardiovascular risk in this group of the population.

**Conflict of interest:** None

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