Research Article

Elevated C reactive protein levels in obese individuals with metabolic syndromes

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ABSTRACT

Background: C reactive protein (CRP) is a sensitive marker of inflammation. Apart from CRP, obesity is also one of the established risk factor for CVD in adults and children. This study was therefore conducted to assess the association between elevated levels of CRP and obesity.

Methods: 1432 patients, >35 years of age who had come to our hospital for the assessment of risk factors for Cardiovascular disease were included into study. A detailed medical and clinical history was taken from all the patients and BMI was calculated based on the height and weight. Phlebotomy was performed on all patients and blood was collected to test the samples for CRP, LDL cholesterol, HDL cholesterol, triglycerides, fasting blood glucose, uric acid.

Results: The mean age for 1432 patients was 55.3 years. Males had a mean age of 57.2 years and females were 52.9 years. The levels of CRP were within the normal ranges till class I obese individuals. Among the class II and III patients there was an elevated level of CRP. Only about 4.5% of the patients with CRP levels more than 10 mg/l had normal BMI while 42.8% of the patients were under the class III obese BMI.

Conclusions: It was shown in our studies that higher BMI is associated with higher CRP concentrations especially in patients with metabolic syndromes.

Keywords: C reactive protein, Obesity, Metabolic syndromes

INTRODUCTION

The acute phase protein, the C reactive protein (CRP) is a sensitive marker of inflammation. Plasma CRP levels are low in healthy patients without acute illness. But through the use of high sensitivity tests, it has been possible to investigate the relation between plasma CRP levels and cardiovascular disease and inflammation.1,2 These tests have shown that CRP is independently associated with the risk of cardiovascular disease causing severe morbidity and mortality along with acute coronary events in both men and women.3-7

Apart from CRP, obesity is also one of the established risk factor for CVD in adults and children.8,9 Obesity has double worldwide since 1980. In 2014, it has been estimated that more than 1.9 billion adults who were 18 years or older were overweight, and of these 600 were obese. 39% of the adults aged 18 years and over were overweight in 2014 and 13% were obese.10,11

Adipose tissue has always been considered a passive storage depot for fat, but it is also known to play an active role in metabolism by producing the proinflammatory cytokine, interleukin-6 (IL 6).11-14 As IL-6 has inflammatory properties, as well as stimulation of acute phase protein production in liver, the release of IL-6 from adipose tissue may induce low-grade systemic inflammation in persons with excess body.13,16
This study was therefore conducted to assess the association between elevated levels of CRP and obesity in patients with metabolic syndromes.

METHODS

1432 patients >35 years who had come to the Department of Medicine were included into the study. This study was conducted over a period of two years at Bhaskara Medical College. All these patients had come to our hospital for the assessment of risk factors for cardiovascular disease.

All these patients were included into the study after obtaining an informed consent. Patients who refused the informed consent or those with an overt inflammatory disease were excluded from the study.

A detailed medical and clinical history was taken from all the patients. Demographic details such as age, gender, height, weight etc. were taken. History of cigarette smoking was noted as ‘never’, ‘occasional’ or ‘regular’. Amount of physical activity was also categorized as never, rare or regular, depending the amount of physical activity done by the patient. BMI was calculated based on Weight (kg) and height (m) of the patient using the formula weight/height. Patients were categorized as normal with BMI <25 kg/m², overweight BMI 25.0-29.9 kg/m², Class I obese BMI 30.0-34.9 kg/m²; Class II obese BMI 35.0-39.9 kg/m²; and class III obese BMI 40.0 kg/m². This categorization was according to the classification proposed by World Health Organizational expert committee. The categorization of metabolic syndrome in patients was based on the third report of national cholesterol educational program expert panel on detection, Evaluation and treatment of high blood cholesterol in adults’ criteria. The following cutoff limits were as per this criteria; 1. Blood pressure \( \geq 135/85 \) mmHg, (2) triglyceride 150 mg/dl, (3) low HDL cholesterol 40 mg/dl for men and 50 mg/dl for women, (4) fasting glucose 110 mg/dl (5) a BMI cut point of 30 kg/m² for obesity. Patients with 3 or more of the above criteria were considered to have a metabolic syndrome.

Phlebotomy was performed on all patients and blood was collected to test the samples for CRP, LDL cholesterol, HDL cholesterol, triglycerides, fasting blood glucose, uric acid.

All statistical analysis was performed using SPSS statistical software (version 10.1).

RESULTS

The mean age for 1432 patients was 55.3 years. Males had a mean age of 57.2 years and females were 52.9 years. Of the patients around 40% had a family history of diabetes.

Table 1: Demographic details of the patients.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean in males n= 687</th>
<th>Mean in females n= 745</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>57.2±3.8</td>
<td>52.9±4.3</td>
</tr>
<tr>
<td>Weight</td>
<td>91.9±2.9</td>
<td>66.9±3.5</td>
</tr>
<tr>
<td>Height</td>
<td>5 ft 10 inches±2 in</td>
<td>5 ft 2 in±5 in</td>
</tr>
<tr>
<td>Family history of diabetes</td>
<td>289 (42.1%)</td>
<td>231 (31%)</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>308 (44.8%)</td>
<td>709 (95.2%)</td>
</tr>
<tr>
<td>Occasional</td>
<td>166 (24.2%)</td>
<td>28 (3.7%)</td>
</tr>
<tr>
<td>Regular</td>
<td>213 (31%)</td>
<td>8 (1.1%)</td>
</tr>
<tr>
<td>Alcoholism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>346(50.4%)</td>
<td>597 (80.2%)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>199 (29%)</td>
<td>106 (14.2%)</td>
</tr>
<tr>
<td>Regularly</td>
<td>142 (20.6%)</td>
<td>42 (5.6%)</td>
</tr>
</tbody>
</table>

The average blood pressure of the patients were in the normal range but the lipid profile of the patients and the fasting blood sugars were on the higher side showing that many of the patients were diabetic.

Table 2: Blood pressure and lipid profile in patients.

<table>
<thead>
<tr>
<th>Systolic blood pressure mmHg</th>
<th>Diastolic blood pressure mmHg</th>
<th>Triglyceride (mg/dl)</th>
<th>HDL cholesterol (mg/dl)</th>
<th>LDL cholesterol (mg/dl)</th>
<th>Fasting plasma glucose (mg/dl)</th>
<th>CRP (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>128.7±21.2</td>
<td>87.2±6.9</td>
<td>134.±17.1</td>
<td>42.6±3.8</td>
<td>146.8±3.9</td>
<td>116.1±17.2</td>
<td>8.43±2.1</td>
</tr>
</tbody>
</table>

The levels of CRP were within the normal ranges till class I obese individuals. Among the class II and III patients there was an elevated level of CRP (Figure 1).
In our study the levels of IL6 were not available. As a result, the hypothesis that increase in IL6 levels increases the CRP levels could not be verified. Thus future studies should be performed to gather this association.

**CONCLUSION**

It was shown in our studies that higher BMI is associated with higher CRP concentrations especially in patients with metabolic syndromes, >10 mg/l levels of CRP suggest a source of infection or inflammation which is more common in obese individuals.

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**Ethical approval: None declared**

**Conflict of interest: None declared**

**REFERENCES**