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Original Research Article

Association between C reactive protein and obesity: a study in a tertiary care hospital

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ABSTRACT

Background: Obesity and dyslipidemia, especially in children and adolescents coupled with impaired blood glucose metabolism and elevated blood pressure may result in atherosclerosis in the older ages. This study was conducted to assess the association between high levels of CRP with obesity.
Methods: Details including height and weight for BMI and serum for C reactive protein estimation was collected for all 134 patients.
Results: 60.4% were females and 49.6% were males. Among the obese patients, clinically raised CRP levels was observed in 29.2% and elevated CRP levels in 45.8% levels, while in overweight patients, 21.4% had clinically raised CRP and 46.4% has elevated CRP levels. In normal BMI patients, elevated CRP was seen in 22% and clinically raised in 1.9%.
Conclusion: Detection of CRP levels in overweight and obese patients is imperative in the early stages itself to prevent cardiovascular diseases.

Keywords: Body Mass Index, Cardiovascular disease, C reactive protein, Obesity, Overweight

INTRODUCTION

In the past few years, the prevalence of obesity and overweight has increased tremendously globally.[1] In developing countries like India there is a sharp rise, due to globalization and changing trends of lifestyle. Obesity and dyslipidemia, especially in children and adolescents coupled with impaired blood glucose metabolism and elevated blood pressure may result in atherosclerosis in the older ages.[2]

Adipose tissue was considered traditionally to be a passive storage place for fat. Of late it has been reported that it plays an active role in metabolism.[3,4] IL-6, or proinflammatory cytokine interleukin 6, which is expressed in the healthy human adipose tissue is released into the circulation.[5-7] It is estimated that 25% of the systemic IL-6 is produced by the adipose tissue. IL-6 has inflammatory properties and it stimulates the production of acute phase proteins in the liver.[8,9] Thus, in obese persons, IL-6 may result in low grade systemic inflammation.

One of the sensitive markers for inflammation is the acute phase reactant, C-reactive protein, the values of which is generally low in the healthy individuals. It has now been associated with various major diseases wherein chronic inflammation is seen. This is more so in the case if cardiovascular diseases, where both obesity and elevated CRP levels have been identified as risk factors.[10-13] Other traditional risk factors for CVD include diabetes and insulin resistance, blood pressure, dyslipidemia and central obesity.

High levels of CRP, especially values above 1mg/dL are constant with acute inflammation. This could be due to ongoing infection, thus should not be considered as marker of chronic infection. In such cases of high levels of CRP, another CRP test after 2 weeks should be done to compare with the first reading.[14-16] Individuals with high levels of CRP have long term health problems including vascular events.[14]

This study was conducted to assess the association between high levels of CRP with obesity.

METHODS

A total of 134 obese patients who came to the General Medicine outpatient ward at Nizams institute of medical sciences with cardiovascular risk factors were included into the study which was done from Jan 2017 to Jan 2018. After getting the clearance from the institutional ethical committee, the procedure was explained in detail to the patients and their relatives and informed consent was taken from all of them. Pregnant women and patients with overt inflammatory diseases were excluded from the study. Other causes of obesity such as Cushing's syndrome, hypothyroidism were excluded from the study. None of these patients were on any drugs for hypertension and Diabetes mellitus.

Demographic details were taken from all the patients such as age, height, weight social/economic status, education were noted, and Body Mass Index was calculated. BMI was classified according to WHO as normal (<25kg/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).[17] Diabetes in the family, smoking and alcoholism was also considered. Blood was collected from the medial cubital vein into a plain tube for the separation of serum. Using this, Random blood sugar, Lipid profile such as triglyceride levels, total, high density, low density and very low density cholesterol were estimated by enzymatic method and C-reactive protein was estimated using chemiluminescence method. ≤0.22mg/dL levels of CRP was categorized as normal, >0.22-1.00 mg/dL was elevated CRP and >1.0 mg/dL was considered as clinically raised CRP levels. Statistical analysis is done using Microsoft excel through bar charts and tables.

RESULTS

Out of the 134 patients included into the study, 81(60.4%) of them were females and 53(49.6%) were males (Figure 1).

The mean age among the males was 58.9±6.3 years and in females it was 51.4±4.9 years.

The Body mass index of most of the male patients was within the normal limits (31 (58.5%)), 19(35.8%) of the males were overweight and 3(5.7%) of them were obese.

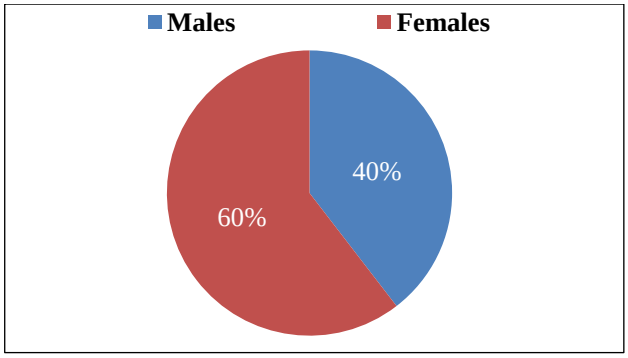

Figure 1: Sex wise distribution of patients.

Table 1: Demographic details of the patients.

Detail	Males (53)	Females (81)
Age	58.9±6.3	51.4±4.9
BMI		
<25 kg/m^2	31	23
25-29 kg/m^2	19	37
≥30 kg/m^2	3	21
Familial history of Diabetes	34	51
Smoking		
Never	27	79
Occasional	15	2
Regular	11	0
Alcoholism		
Never	18	68
Occasional	21	12
Regular	14	1

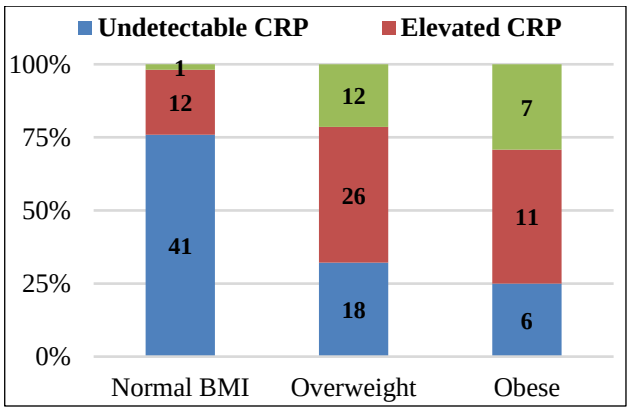

Figure 2: CRP levels among patients.

Among the women, 23(28.4%) were normal, 37(46.7%) were overweight and 23(43.4%) were obese. 34(64.2%) of the males had and 51(63%) of the women had a familial history of diabetes. 11(20.8%) of the males were regular smokers though majority of them did not smoke at all. Most of the women (97.5%) of them were not smoking. Among the alcoholics, 1 woman (1.2%) was a regular drinker, while among the males it was 14(26.4%). 18 men (34%) and 68(84%) women never drank (Table 1).

Most of the patients with normal BMI had undetectable CRP levels while 12(22.2%) had elevated CRP levels. Only one patient (1.9%) had clinically raised CRP levels. In contrast, among persons who were overweight, 12(21.4%) were clinically raised CRP levels and 26(46.4%) had elevated CRP levels. 7(29.2%) of the obese patients had clinically raised CRP levels, 11(45.8%) had elevated levels and elevated CRP while 6(25%) of them had normal levels of CRP (Figure 2).

DISCUSSION

In the present study, authors evaluated the CRP levels against the BMI of the patients. One of the major risk factors for Cardiovascular disease is overweight and obesity. Elevated CRP levels and low grade inflammation are also reported to be one of the risk factors.[18,19] Elevated CRP levels are reported to be the predictors of CVD.[20,21]

There was a slightly more prevalence of females who were overweight or obese in the present study. Clinically raised or elevated levels of CRP was also seen more in them. In obese patients, a greater number of patients (29.2%) of the patients had clinically raised CRP levels and among the overweight patients the same was seen in 21.4% of them, while among the patients with normal BMI, only 1.9% of the patients had a clinically elevated CRP level. Elevated levels of CRP were seen in 22.2% of the patients with normal BMI, while in patients who were overweight, the same was seen in 46.4% in overweight patients and in obese patients, it was 45.8%.

Obesity is said to be positively associated with the CRP levels, with the adipose tissue modulating it.[22,23] A reduction in the fat levels resduced the CRP levels also.[24] In their study, Tchernof et al found a positive association between body fat mass, fat free mass and intra-abdominal adipose tissue with CRP levels.[24] Another study, CT measured visceral fat accumulation was also found to be associated with elevated CRP levels.[25] In another study, waist to hip ration was also found to be significant.[22] In a study, emotional variables such as depression seemed to have an effect on the elevated CRP levels.[26] Obese patients with depressive moods were found to have a higher CRP levels compared to the non-obese patients.[27] Many studies have also reported association of BMI to higher CRP levels and their association with a risk to CVD in adolescents compared to normal weight children.[26-28]

Another condition which has been reported to be caused due to elevated CRP levels is diabetes mellitus. One of the mechanisms resulting in DM is altered sensitivity to insulin, more liberation of the adhesion molecules by the endothelium. There is also an increase in the hepatic function and production of fibrinogen and platelet coagulation factor.[9] This association with diabetes has also been reported to be due to the inflammatory cytokines released by the adipocytes.[23,29]

Our study showed an increased prevalence of elevated CRP in women rather than in men. This could be because obesity is more prevalent in women than in men. This was corroborated in a study by Visser et al who also observed that there was more body fat prevalence in women than in men. This association with BMI and CRP was observed in other studies as well.[30,31]

CONCLUSION

There is a positive correlation between elevated CRP levels and BMI. This is more so in women who tend to have more accumulation to adipose tissue than men. Since both these are risk factors for CVD, an early detection of CRP in obese patients will be helpful to prevent CVD.

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