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Original Article
Bangladesh Journal of Infectious Diseases
June 2017, Volume 4, Number 1
ISSN (Online) 2411-670X; ISSN (Print) 2411-4820
DOI: http://dx.doi.org/10.3329/bjid.v4i1.37676

Serum High Sensitive C-Reactive Protein in Obese Persons with Normal Glucose Tolerance & Impaired Fasting Glucose

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[Received: 10 January 2017; **Revised:** 12 March 2017; **Accepted:** 1 May 2017; **Published:** 1 June 2017]

Abstract

Background: Obesity, characterized by increased fat mass and is currently regarded as a pro-inflammatory state and frequently associated with increased risk of cardiovascular diseases including Myocardial Infarction and also future risk for development of metabolic disorders such as T2DM. High-sensitivity C-reactive protein is a well-known inflammatory marker. **Objective:** In this study we aimed to determine the levels of serum high-sensitive C-reactive protein in obese parsons with normal glucose tolerance (NGT) and obese with impaired fasting glucose (IFG) individuals. **Methodology:** This was a case-control study which was conducted in the Department of Biochemistry, ZH Sikder Women's Medical College, Dhaka during the period of July 2014 to June 2015. The age, sex and body mass index (BMI $\geq$ 30 kg / m^2) matched 25 obese subjects with NGT were selected as control group and 25 obese patients with IFG were selected as case group. We measured levels of serum high sensitive C-reactive protein in all groups. Subjects of both obese groups had significantly higher hs-CRP levels than the normal range. **Results:** A total number of 50 subjects were recruited for this study of which 25 obese subjects with NGT were selected as control group and 25 obese patients with IFG were selected as case group. The level of hs-CRP in obese with NGT and with IFG were found 2.91±1.56 mg/L & 3.42±1.72 mg/L, respectively. There are no significant difference between hs-CRP levels of obese subjects than the subjects with IFG ($p>0.1$). **Conclusion:** This study finding has concluded that obesity raises serum hs-CRP level. IFG obese individuals are not at much higher cardiovascular and metabolic risk level than normal obese parsons. [Bangladesh Journal of Infectious Diseases 2017;4(1):21-24]

Keywords: Obesity; impaired fasting glucose; high-sensitivity C-reactive protein; cardiovascular risk

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Conflict of interest: There is no conflict of interest to any of the authors of this article.
Funding agency: This research work was performed by own cost.
Contribution to authors: SF, SS & OHA contributed from protocol preparation, data collection, data analysis up to report writing. MA & SA prepared and revised the manuscript.
How to cite this article: Fahmi S, Shahriah S, Any OH, Akter M, Afrin S. Serum High Sensitive C-Reactive Protein in Obese Persons with Normal Glucose Tolerance & Impaired Fasting Glucose. Bangladesh J Infect Dis 2017;4(1):21-24

Introduction

C-reactive protein (CRP) is an inflammatory marker produced and released by the liver under the stimulation of cytokines such as tumour necrosis factor-α and interleukins 1 and 6. It affects the process of atherothrombosis[1-2], hence has emerged as a powerful risk marker for cardiovascular diseases[3-5]. State of low-grade systemic inflammation is associated with obesity as well as T2DM[6]. State of subclinical inflammation has also been proposed as one of the mechanism for pathogenesis of T2DM[7].

Current prospective studies have suggested that an elevated level of CRP is associated with an increased risk of developing type 2 diabetes[8-10]. Bjørnholt et al[11] described the excess risk of cardiovascular deaths in non-diabetic men in the upper normal range of fasting blood glucose. Tominaga et al[12] concluded that impaired glucose tolerance was a risk factor for cardiovascular disease but not IFG. In the Rancho Bernardo Study[13], an increase of fasting plasma glucose from 5 to 7 mmol/L was associated with a doubling of cardiovascular disease mortality in men and a tripling in women.

High sensitivity assays are needed for the measurement of C reactive protein concentration for the purpose of predicting the risk of future coronary events[14]. Data is obscure about association of serum high sensitive CRP with obese individuals' associated cardio-metabolic abnormalities. Present study was aimed to evaluate and compare levels of serum hsCRP in obese parsons having normal blood glucose and obese with IFG individuals to predict at more future risks for the development of cardio-metabolic disorders.

Methodology

The study was carried out in the Department of Biochemistry, ZH Sikder Women's Medical College, Dhaka, Bangladesh during the period of July 2014 to June 2015. Study aimed to evaluate and compare levels of serum hsCRP in obese individuals with NGT (fasting glucose ≤110 mg/dl or ≤6.1 mmol/L) as control and obese with IFG (fasting glucose 110 to 126 mg/dl or 6.1-7mmol/L) as case group. In this outpatient department based case control study, we selected 25 obese patients with NGT and another 25 age, sex and BMI matched individuals with IFG. Age of controls and cases groups was18 to 50 years. Anthropometric measurements and body mass index (BMI) were calculated as body weight (Kg)/Height^2 (m) BMI >30 were selected as eligible participants. Informed consents were obtained from the participants and confidentiality of data assured

Participants were invited to give blood samples after overnight fast and 5 ml venous blood samples were drawn in fluoride and plain bulbs. In clinical laboratory of Biochemistry department, blood glucose levels were estimated by standard method or glucose oxidase-peroxidase method. Glucose tolerance was studied during oral glucose tolerance test (OGTT) and 2006 WHO criteria were applied. The hs-CRP was determined in serum by immune-nephelometric principle using BNII Systems, Dade Behring, USA. Exclusion criteria for entry into the study were smoking habit, sustained hypertension, dyslipidemia, renal failure, heart failure, peripheral vascular disease, acute or chronic infection, cancer, and hepatic disease and type 2 diabetic patients. Statistical analysis was done by SPSS statistical software. The values were reported as mean±SD. Student 't' test as appropriate to compare two groups. $P<0.05$ was accepted as statistically significant.

Results

A total number of 50 subjects were recruited for this study of which 25 obese subjects with NGT were selected as control group and 25 obese patients with IFG were selected as case group. The mean age of the case and control groups were 44.3±2.1 years and 42.3± 6.2 years respectively. The male and female ratios of case and control groups were 1.3:1 and 2.6:1 respectively. The mean BMI of case and control groups were 32.1±2.6 and 31.6±3.2 respectively. Age, gender distribution and BMI did not differ among the groups by selection. Metabolic parameters were not different among the study groups as a result of the selection process.

The mean serum levels of hs-CRP in obese with IFG and normal obese subjects were 3.42±1.72 with the minimum of 0.52 and the maximum of 4.2 and 2.9±1.56 with the minimum of 0.43 and the maximum of 3.73 mg/L respectively. There were not significantly higher hs-CRP levels in patients with IFG than in NGT obese subjects ($p> 0.1$). The levels of serum hs-CRP were related to fasting glucose in both NGT obese and IFG obese groups ($p> 0.05$) (Table 1).

Table 1: Demographic, Clinical and Biochemical Variables of Study Participants (Mean±SD)

Variables	Control group (n= 25)	Case group (n= 25)	t value	P value
Age (years)	42.3± 6.2	44.3±2.1	1.5277	0.1332
Sex (Male:Female)	2.6:1	1.3:1	-	-
BMI (kg/m^2)	31.6±3.2	32.1±2.6	0.6063	0.5471
FBS (mg/dL)	81.5±12.3** (78-96)	121±11.6 (112-124	11.6815	<0.0001
S. hsCRP (mg/L)	2.91±1.56*(0.43- 3.73)	3.42±1.72 (0.52-4.2)	1.0982	0.2776

Unpaired students `t' test = statistically not significant* p value >0.1, highly significant ** p<0.0001; FBS= Fasting blood sugar

Discussion

In subjects with IFG, fasting plasma glucose concentrations range between 110 and 126 mg/dl, is probably a frequent glycemic disorder in the general population and is considered as a prediabetic state[15]. Cardiovascular risk associated with IFG has been examined various studies with conflicting results[16]. In previous study stated that elevated serum hs-CRP is associated with obesity[17], and acute inflammation[18].

Higher concentration of C-reactive protein (excess of 5 mg/L) than the serum concentration of 1 to 3 mg/L that is associated with cardiovascular risk[19]. The American Heart Association and U.S. centers for disease control and prevention have defined risk groups as <1 low, 1-3 average and >3 mg/L hs-CRP at high risk groups for the cardiovascular events. Present study compared serum hs-CRP levels in obese parsons having normal blood glucose and obese parsons having IFG to predict the future risks.

It has been found that the mean of serum hsCRP of NGT obese & obese with IFG individuals were 2.91±1.56 mg/L & 3.42±1.72 mg/L and averages were 0.43-3.73 mg/L & 0.52-4.2 mg/L respectively. It has been observed that the favorable metabolic and inflammatory profile is found among all obese individuals, in spite of significantly high glycemic difference in both obese groups. Statistically significant difference is not found in serum hs-CRP in comparison between two groups. Both groups have showed a higher rate of serum hs-CRP which were at average risk group for cardio-metabolic disorders. Raised hs-CRP in group II cannot confirm the reason whether it was due to obesity or IFG. IFG has been widely studied in the last years but its cardiovascular risk profile is not yet completely clear. Several studies done earlier have also shown that hs-CRP predicts diabetes in western populations[20].

There are limited data in Bangladesh. Although the association of the metabolic syndrome with elevated hs-CRP is now well established, the relation of CRP to fasting glucose is controversial despite its theoretical importance. Aranson et al[21] and Hak et al[22] found an association between CRP levels and fasting glucose, but in several other studies CRP levels were not associated with fasting glucose concentrations.

Furthermore, it is possible that chronic inflammation may represent a triggering factor in the origin of insulin resistance syndrome, type 2 diabetes, and impaired fasting glucose[23-24]. On the other hand, decreased insulin sensitivity may lead to enhanced CRP expression by counteracting the physiological effect of insulin on hepatic acute phase protein synthesis[25].

Thus this data show that IFG obese individuals are not sufficient to suggest that they are at higher cardiovascular and metabolic risk group. These findings suggest potential benefits of anti-inflammatory or insulin-sensitizing treatment strategies in these subjects. In Bangladesh obesity becomes the burning issue among the school going children. In this regards people of Bangladesh should be aware of this.

Conclusion

In conclusion, this study reveals that obesity elevates serum hs-CRP. Both case and control groups are at average risk group and IFG obese individuals are not at higher cardio-metabolic risk level than NGT obese parsons. This emphasizes need to promote the control of weight. Clinicians should not overlook metabolic abnormalities in obese individuals. This may be linked the different metabolic disorders among the obese persons. Large scale prospective studies are clearly needed to address these issues.

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