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IJPBS |Volume 4| Issue 1 |JAN-MAR|2014|99-103

Research Article
Biological Sciences

STUDY OF hsCRP LEVELS IN EARLY METABOLIC SYNDROME PATIENTS AND IN SUBJECTS WITHOUT IT

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ABSTRACT

Background: *The metabolic syndrome (MetS) is a constellation of visceral obesity, dyslipidaemia, hyperglycaemia, and hypertension. Considering the fact that the inflammation is the underlying risk factor for CVD, this study was undertaken to estimate the levels of high sensitive C - reactive protein (hsCRP) in subjects with and without metabolic syndrome.* ***Materials and Methods:*** *The study population included 50 male subjects with metabolic syndrome and 50 subjects without metabolic syndrome. Blood pressure and anthropometric measurements were measured in all the study subjects, following which a fasting blood sample was obtained for the estimation of fasting blood sugar, lipid profile and hsCRP. The data obtained was analyzed using SPSS software. AHA/NHLBI definition was used to define MetS. The values obtained were compared using student t test and correlated using Pearson correlation.* ***Results:*** *hsCRP levels were high among the subjects with MetS and it was statistically highly significant (<0.01). Pearson's product-moment correlation of hsCRP with age and the components of the MetS yielded a positive and highly significant (<0.01) correlation with age and fasting blood sugar. The prevalence of risk group in MetS was 47%.* ***Conclusion:*** *Raised hsCRP was found to be associated with metabolic syndrome, suggesting that early MetS patients are also at risk for cardiometaboilc events.*

KEY WORDS

Metabolic syndrome, hsCRP

INTRODUCTION

The metabolic syndrome (MetS) is a constellation of visceral obesity, dyslipidaemia, hyperglycaemia, and hypertension. MetS increases the tendency to develop type 2 diabetes mellitus (T2DM) and coronary heart disease (CHD).[1] High sensitive C-reactive protein (hsCRP) is an acute phase reactant and a sensitive marker of systemic inflammation has been found to be raised in the conditions like diabetes mellitus, cardiovascular diseases, peripheral vascular disorders etc.[2-4] Previous studies have proved that T2DM is frequently associated with chronic inflammatory state. Thus, chronic inflammation plays an important role in the development and progression of late complications of diabetes. It predicts the mortality in patients with T2DM. This emphasizes the utility of estimating hsCRP as cardiometabolic risk factor.[5]

Since T2DM being the sequel of the MetS, may not be devoid of inflammation. Hence, the present study was undertaken to find the prevalence of raised hsCRP in MetS patients. The hsCRP values in the apparently healthy newly diagnosed MetS subjects are less clear. Therefore, this study also intended to find the relationships between hsCRP and MetS components. Also there are less number of such studies with the new definition of MetS i.e. with American Heart Association; National Heart, Lung, and Blood Institute (AHA/NHLBI) definition.

MATERIALS AND METHODS

This cross sectional study was conducted in the Sri Siddhartha medical college, Tumkur. This study was carried out for a period of six months from July to December 2013 after obtaining the approval from the institutional ethics committee. The study population included the apparently healthy subjects attending the hospital for routine annual health check up. A written informed consent was obtained from the participants after explaining the objectives and procedures of the study. Fifty MetS adult (>18years) males, who fulfilled the AHA/NHLBI MetS definition for South Asians (**Table 1**)[6] were selected as cases and age matched 50 male subjects without MetS were considered for controls. Diagnosed diabetics, hypertensives, subjects with thyroid disorders or any other ailment were excluded from the study. This study included only male patients to minimize the variability and to overcome the limited sample size. Blood pressure and anthropometric measurements were taken using calibrated standard instruments. The anthropometric measurements, namely body weight, height and waist circumference (WC) were measured using standardized equipments. Blood pressure was measured in a sitting position on the left arm with a mercury sphygmomanometer to the nearest 2mm Hg. Systolic (SBP) and diastolic (DBP) blood pressure measurements were taken twice to reduce intra observer variations and were averaged for the analyses. A third measurement was taken only when the difference between the two measurements was ≥ 5 mmHg. A blood samples were collected after an overnight fast of 8-12 hours. The blood samples were collected in plain, gel vacutainers, allowed to clot and centrifuged. The separated serum was used for the estimation of fasting blood sugar (FBS), lipid profile and hsCRP. FBS, lipid profile assays and hsCRP were estimated on integrated Auto analyzer system (Roche Diagnostics) using dedicated calibrators, controls and reagents. Quantitative data summarized to test the difference in mean values obtained for MetS subjects and non MetS subjects using student't' test, p value < 0.05 is taken as the level of significance. Further, Pearson's correlation was used to correlate between the hsCRP and the components of the MetS.

Table 1: shows the AHA/ NHLBI definition of metabolic syndrome for South Asian population

Components	Males	Females
Hypertension (mm of Hg)	≥130 or 85	≥130 or 85
Hyperglycemia FBS (mg/dl)	≥100	≥100
TGL (mg/dl)	≥150	≥150
HDL (mg/dl)	<40	<50
WC (cm)	WC ≥90	WC ≥80
Any 3 of the 5 features		

RESULTS

The results obtained are shown in **Tables 2, 3 and 4.** **Table 2** shows the comparison of Mean ± SD between the cases and controls. It is shown that there is highly significant difference in the values not only for the MetS components but also for hsCRP levels. The hsCRP levels were high among the subjects with MetS and it was statistically highly significant (<0.01).

Table 3 shows the Pearson's product-moment correlation of hsCRP with age and the components of the MetS. The correlation was positive and highly significant (<0.01) with age and FBS.

Table 4 shows the proportions of the risk groups based on hsCRP in cases and controls. Statistical

analysis by Fischer's exact test, show a statistically highly significant difference (<0.01) i.e. significant proportion of cases are at high risk based on the hsCRP values. It can also be inferred from the table 4 that prevalence of risk group (including both medium and high risk groups) in MetS is 47% and in controls it is 29%. The sensitivity and specificity of hsCRP for MetS was found to be 94% and 42% respectively.

Table 5 shows the Pearson's Chi-squared test between the hsCRP and the components of the metabolic syndrome. It is shown that significant proportions of risk group were present in aged, hyperglycemic and in individuals with low HDL.

Table 2: Shows the comparison of Mean ± SD between the cases and controls

	Cases	Controls	p value*
Age (year)	44.4±11.3	41.1±17.4	0.27
Weight (kg)	73.4±10.1	57.6±7.9	<0.01
Height (cm)	168.4±6.3	165.7±7.6	0.06
Systemic blood pressure (mmHg)	129.2±12.1	118.4±11.3	<0.01
Diastolic blood pressure(mmHg)	87.1±7.6	76.1±8.1	<0.01
FBS (mg/dl)	117.1±31.1	85.6±8.4	<0.01
TGL (mg/dl)	211.2±80.2	122.8±72.6	<0.01
HDL (mg/dl)	29.4±5.3	36.1±7.6	<0.01
WC (cm)	95.3±7.2	77.6±8.1	<0.01
hsCRP (mg/L)	5.0±1.9	1.5±1.2	<0.01

*student t test

Table 3: Shows the Pearson's product-moment correlation of HSCRP with age and the components of the metabolic syndrome

	r value	p value
Age	0.46	<0.01
Systolic blood pressure	0.07	0.60
Diastolic blood pressure	0.11	0.40
FBS	0.82	<0.01
TGL	0.25	0.07
HDL	-0.17	0.21
WC	0.17	0.23

Table 4: Shows the proportions of the risk groups based on hsCRP in cases and controls

Risk groups	Cases	Controls	p value*
Low risk (<1mg/L)	3	21	<0.01
Medium risk (1-3 mg/L)	8	18	
High risk (>3 mg/L)	39	11	

*Fisher's Exact Test for Count Data

Table 5: Shows the Pearson's Chi-squared test between the hsCRP and the components of the metabolic syndrome

	X^2	p value
Age	45.64	<0.01
Systolic blood pressure	0.58	0.74
Diastolic blood pressure	0.58	0.74
FBS	21.15	<0.01
TGL	1.25	0.54
HDL	45.64	<0.01
WC	2.29	0.31

DISCUSSION

T2DM, a sequel following the MetS is known to be associated with the high hsCRP due to the underlying ongoing inflammation.[7] This study intended to identify the prevalence of the raised hsCRP in the at risk category for T2DM i.e. in the apparently healthy MetS subjects.

The present study shows the presence of raised hsCRP in the apparently healthy MetS subjects. The hsCRP values were found to be high (5.0 ± 1.9) in the MetS when compared with the subjects without MetS (1.5 ± 1.2). The increase was statistically highly significant (<0.01). Monteiro CMC et al found 18.2 ± 2.3 mg/l levels of hsCRP in their male population. The high values noted in their study are because of their inclusion of diabetics and patients with acute coronary syndrome. Our study encountered fewer values in newly detected MetS subjects which may be suggestive of the serial rise of hsCRP values from MetS to T2DM and to its complication including CHD.[8] A study on Japanese population as shown that low levels of hs-CRP which was not bimodally distributed were significantly related to metabolic risk factors. Hence, low level raise should not be underestimated.[9]

The prevalence of raised hsCRP the MetS subjects were found to be 47%. The sensitivity and specificity of hsCRP for MetS was found to be 94% and 42% respectively. Huffman FG et al had found the odds of having elevated hs-CRP levels were approximately 4 times higher in Cuban Americans with metabolic syndrome than in those without it.[10]

The hsCRP showed positive correlation with age and the components of the MetS. The correlation was positive and highly significant (<0.01) with age and FBS. Aronson D et al found that CRP levels to be correlating with the FBS significantly and positively. They also showed that CRP levels increased continuously across the spectrum of fasting glucose, beginning in the lowest quartile of normal fasting glucose. Their findings suggested that a proinflammatory effect may contribute to the adverse cardiovascular outcome associated with diabetes, impaired fasting glucose, and increasing glucose levels within the normal range.[11]

With this study it is evident that MetS patients are associated with underlying inflammation indicated by raised hsCRP. A follow up study would be interesting if hsCRP levels are estimated following the intervention for MetS. The limitations of this study are small sample size, exclusion of the females. A follow up study with large sample size would validate the findings of this study.

CONCLUSION

In conclusion, higher levels of hsCRP may predict the MetS and also show the relationship existing between inflammation and metabolic syndrome, in particular the hyperglycemia.

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