



C-REACTIVE PROTEIN (CRP); IN PATIENTS WITH METABOLIC SYNDROME

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INTRODUCTION

The metabolic syndrome (MS) associated with ischemic heart disease, fatty liver and several malignancies^{1,2}. The syndrome includes raised triglycerides level and blood pressure, reduced high-density lipoprotein cholesterol (HDL-C), hyperglycemia and increase waist circumference³. The insulin resistance frequently occurs in metabolic syndrome which leads to diabetes mellitus, NAFLD, hypertension, cholelithiasis, polycystic ovarian syndrome, obesity and sleep apnoea^{4,5}. The prevalence of metabolic syndrome in Pakistan reported by Basit A, et al was 46%,⁶ while the proportion for each component of metabolic syndrome formerly reported was increase waist circumference 28%, hypertension 23.8%, hyperglycemia 4.7%, reduced HDL-C 87.6% and hypertriglyceridemia 12.5%⁵.

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ABSTRACT... Objective: To determine the frequency of raised C-reactive protein (CRP) in patients with metabolic syndrome. **Patients and methods:** This cross sectional descriptive study of six months study was conducted at Liaquat University Hospital Hyderabad. All the patients of 20 to 60 years of age, of either gender presented with symptoms of metabolic syndrome for more than 01 year duration were admitted and evaluated for C-reactive protein. The data was analyzed in SPSS 16 and the frequency and percentage was calculated. **Results:** Total one hundred patients (59 females and 41 males) with metabolic syndrome were evaluated for C-reactive protein. The mean waist circumference for males and female patients with raised CRP was 48.93 ± 2.33 and 48.42 ± 3.41 while the mean \pm SD of serum triglycerides level for male and female with raised CRP was 192.41 ± 3.21 and 196.31 ± 3.43 respectively. The mean \pm SD of serum HDL-C level for male and female with raised CRP was 28.32 ± 1.22 and 25.31 ± 1.42 . The mean \pm SD of systolic and diastolic pressure for males and female patients with raised CRP was 150 ± 3.42 and 100.51 ± 4.42 . The mean \pm SD of serum fasting blood sugar for male and female patients with raised CRP was 131.52 ± 3.33 and 143.42 ± 7.42 respectively. The mean \pm SD of CRP for male and female patients with raised CRP was 4.42 ± 1.21 and 5.8 ± 2.52 . In relation to gender distribution, the majority of subjects from 40-49 years of age group with female predominance ($p = 0.01$) while the CRP was raised in 67% patients in relation to age ($p=0.05$) and gender ($p=0.04$) respectively. Out of 67 subjects with raised CRP 44 were females and 23 were males.

Conclusions: The CRP was raised in patients with metabolic syndrome.

Key words: Metabolic syndrome, Triglycerides, High Density Lipoprotein, Hypertriglyceridemia, Lipoproteins, Syndrome X, Obesity and Hypertension

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C-reactive protein (CRP) is an acute phase protein and inflammatory marker synthesized by liver⁷. The cytokines like IL1, IL6 and TNF stimulate the production of CRP in response to infection and inflammation⁸. Metabolic syndrome also considered a proinflammatory state and by evaluating the CRP reduction in the prediction for cardiovascular disease and diabetes can be possible^{9,10}. Former studies considered CRP as a component of metabolic syndrome¹¹⁻¹⁵. The prevalence of raised C-reactive protein in patients with MS reported by Ford ES, et al was 38%¹⁶.

The study was evaluate the disturbance in CRP in patients with MS, as the inflammatory property of CRP is the main route to acquire cardiovascular and cerberovascular accident in patients with metabolic syndrome, so early identification and

appropriate measure to control the CRP can inhibit its inflammatory effects and reduce atherogenic events.

PATIENTS AND METHODS

This study was conducted at Liaquat University Hospital Hyderabad. All the patients of metabolic syndrome for ≥ 01 year duration, of 20 to 60 years of age and of either gender were recruited and entered in the study while the patients who were known cases (already diagnose) of renal disease, severe heart failure, thyroid hormonal disorder, familial hypercholesterolemia and hypertriglyceridemia, liver disease, autoimmune disease, malignancy already on lipid lowering therapy, on beta antagonists and steroids, thiazide diuretics, oral contraceptives, immunosuppressive therapy, anti-tuberculosis drugs and on hormone replacement therapy (HRT) were considered in the exclusion criteria. The detail history, clinical examination was done and specific investigations were advised for every relevant patient. A written consent was taken from every relevant patient for participation in the study as well as for clinical procedures. The metabolic syndrome was detected according to the NCEP-ATP III protocol¹⁷ i.e. 1. WC (≥ 40 inches for men and ≥ 36 inches for women), 2. TG ≥ 150 mg/dL, 3. HDL cholesterol < 40 mg/dL for male and < 50 mg/dL for female, 4. Blood pressure $\geq 130/85$ mm Hg and 5. FBS ≥ 110 mg/dL. The metabolic syndrome was labeled when there is presence of any ≥ 03 out of 05 components (mentioned above). After confirmation / detection of metabolic syndrome, the 2cc venous blood sample was taken with sterilize 5cc disposable syringe, label it and sent to laboratory for evaluation of CRP levels where the data was collected on pre-designed proforma. After that, the data of all patients was entered and analyzed in SPSS version 16.00. The frequency and percentage (%) was calculated for raised C-reactive protein in patients with MS. The normal reference range for C-reactive protein is 0-1.0 mg/dL while the level > 1.0 mg/dL was considered as raised. The frequency and percentage (%) was also calculated for gender distribution for metabolic syndrome patients. The mean and standard deviation (SD) was calculated for age,

duration of symptoms, WC, TG, high density, HDL, BP and FBS. The stratification was done for age and gender with raised CRP in patients with metabolic syndrome. The Chi-Square test was applied and the statistical significance was considered on p-value ≤ 0.05 .

RESULTS

Total 100 patients with metabolic syndrome were evaluated for C-reactive protein during the six months study period. Majority of patients were from urban areas 70%. The mean \pm SD for age of patients with metabolic syndrome was 48.93 ± 5.71 . The mean age \pm SD of patient with raised CRP was 47.93 ± 6.32 . The age in relation to gender is shown in Table I.

The mean \pm SD of waist circumference for whole male and female population was 46.52 ± 7.31 and 47.42 ± 5.21 whereas the mean circumference for males and female patients with raised CRP was 48.93 ± 2.33 and 48.42 ± 3.41 respectively.

The mean \pm SD of serum triglycerides level was 210 ± 8.21 while for male and female patients of whole population were 190.82 ± 7.32 and 198.22 ± 4.32 whereas for males and female patients with raised CRP was 192.41 ± 3.21 and 196.31 ± 3.43 respectively.

The mean \pm SD of serum HDL-C level was 25 ± 3.32 while for male and female patients of whole population were 25.41 ± 5.43 and 22.52 ± 5.21 whereas for males and female patients with raised CRP was 28.32 ± 1.22 and 25.31 ± 1.42 respectively.

The mean \pm SD of systolic and diastolic pressure was 160.32 ± 10.93 and 100.82 ± 4.21 while the systolic and diastolic blood pressure for male and female patients of whole population was 150.42 ± 5.22 and 105.31 ± 3.21 whereas the systolic and diastolic blood pressure for males and female patients with raised CRP was 150 ± 3.42 and 100.51 ± 4.42 respectively.

The mean \pm SD of serum fasting blood sugar was 137 ± 4.22 while for male and female patients of whole population were 134.82 ± 4.32

and 135 ± 3.21 whereas for males and female patients with raised CRP was 131.52 ± 3.33 and 143.42 ± 7.42 respectively. The mean \pm SD of CRP was 6.3 ± 1.31 while for male and female patients

with raised CRP was 4.42 ± 1.21 and 5.8 ± 2.52 respectively. The age and gender in relation to CRP is shown in Table II and III.

		GENDER		Total	P-value
		Male	Female		
AGE	20-29	4	4	8	0.01*
		9.8%	6.8%	8.0%	
	30-39	14	7	21	
		34.1%	11.9%	21.0%	
	40-49	21	37	58	
		51.2%	62.7%	58.0%	
	50-60	2	11	13	
	4.9%	18.6%	13.0%		
Total		41	59	100	
		100.0%	100.0%	100.0%	

Table-I. The age and gender distribution of patients with metabolic syndrome
*P-value is statistically significant Pearson Chi-square value = 10.06; df = 3

		CRP		Total	P-value
		Raised	Normal		
AGE	20-29	6	2	8	0.05*
		9.0%	6.1%	8.0%	
	30-39	10	11	21	
		14.9%	33.3%	21.0%	
	40-49	44	14	58	
		65.7%	42.4%	58.0%	
	50-60	7	6	13	
	10.4%	18.2%	13.0%		
Total		67	33	100	
		100.0%	100.0%	100.0%	

Table-II. The age distribution in relation to CRP
*P-value is statistically significant Pearson Chi-square value = 6.87; df = 3

DISCUSSION

The metabolic syndrome associated with diabetes and cardiovascular disease and linked to raise serum CRP¹⁸.

In present study the CRP is raised in 67% patients with metabolic syndrome, of which 44 were females and 23 were males. These proportions are consistent with the former literature reported

for Mexican American men and women (<48% and <58%, respectively)¹⁹. On the other hand there was no difference of metabolic syndrome as far as gender is concerned in the study by Helvacı RM, et al²⁰. whereas another study proved the female predominance in MS²¹.

In present study the CRP was used as a screening tool to evaluate the risk to acquire any

		CRP		Total	P-value
		Raised	Normal		
Gender	Male	23	18	41	0.04*
		34.3%	54.5%	41.0%	
	Female	44	15	59	
		65.7%	45.5%	59.0%	
Total		67	33	100	
		100.0%	100.0%	100.0%	

Table-III. The gender distribution in relation to CRP

*P-value is statistically significant Pearson Chi-square value = 3.73; df = 1

adverse cardiovascular event in subjects with MS. Former study was also found the low grade inflammation in subjects with MS²². The elevation of CRP was four time higher in MS than non metabolic syndrome patients²³. It has been found the positive association between abdominal obesity and raised CRP level, because adipose tissues produce cytokines which stimulate the CRP production, infact the adipose tissue itself produce CRP and leads to increased serum CRP level²⁴. The CRP is proatherogenic and prothrombotic because of its interaction with low density lipoprotein, complement system and production of tissue factors by macrophages and in such manner it is a risk factor for coronary heart disease²⁵.

In our series the majority of patients were in 40-49 years of age and it is consistent with the study by Tanchoco CC, et al²⁶. In current series the female population is predominant and the same observation was reported by Schmitt AC, et al and Bentley-Lewis R, et al^{27,28}. Genetic polymorphisms also play a role in obesity, production of CRP and inflammatory profile as far as metabolic syndrome is concerned.

Therefore the metabolic syndrome involved in inflammatory response leads to atherothrombotic disease that increased the risk of coronary heart diseases

CONCLUSIONS

The study found an association between CRP and the MS. Thus, the observations might open new perspectives for atherosclerosis development, its

prevention and management strategy.

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