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Study of C-Reactive Protein in Hypertension and its Role in Development of Hypertension

[1]Dr. Gulab Kanwar and [2]Dr. Mohd Shakeel*

1Head & Professor, Department of Biochemistry,
Government Medical College, Kota, Rajasthan, India.
2Post Graduate Resident, Department of Biochemistry,
Government Medical College, Kota, Rajasthan, India.
Corresponding author's email id sanskaar1982@gmail.com

Abstract

Hypertension is one of the most important risk factor for cardiovascular disease and has become an increasingly important contributor to the global health burden. Inflammation and mounting of inflammatory markers (acute phase reactants) are important pathogenic mechanism in development of hypertension. It could be either a causative factor in the pathogenesis of hypertension or a sequel to it. In the view of the probable involvement of the acute phase reactants, present study is planned to investigate role of C-reactive protein (CRP) in development of hypertension and find out its correlation with blood pressure if any exist.

For this study subjects (males) between 30-60 years of age were selected from the general population of Kota district (Rajasthan, India) and screened for hypertension. The study was done at MBS hospital & New Medical Hospital and College, kota. C-reactive protein levels in the serum of 50 hypertensive cases and 50 healthy sex and age matched control subjects were determined on TRANSASIA EM-360 auto-analyzer using standard protocols. Results are expressed as Mean ± SD. Data are analyzed with the help of Microsoft excel 2007, using student's t-test, and strength of association between two variables is measured by Pearson's correlation coefficient (r). The mean serum CRP levels were significantly higher in cases (hypertensive subjects) as compared to control (healthy subjects) group (17.27±12.24mg/l versus 8.28±5.78mg/l, $p<0.0001$). CRP level showed a significant positive correlation with systolic blood pressure ($p<0.001$).Therefore mounting of inflammatory markers is an important pathogenetic phenomenon in hypertension. So appropriate measures should be taken to bring these

parameters in limit for better prognosis and to avoid ill effects of hypertension.

Key words: Hypertension, Systolic blood pressure, C-reactive protein, Inflammatory marker, Acute phase reactants.

INTRODUCTION

Hypertension is one of the most important risk factors for cardiovascular disease and has become an increasingly important contributor to the global health burden (1, 2). The estimated total number of adults with hypertension in 2000 was 972 million. Of these, 333 million were estimated to be in economically developed countries and 639 million in economically developing countries. By 2025, the number of people with hypertension will increase by about 60% to a total of 1.56 billion as the proportion of elderly people will increase significantly (3). The prevalence of hypertension in India 59.9 and 69.9 per 1000 in males and females respectively in urban population (4) and 35.5 and 35.9 per 1000 in males and females respectively in the rural population (5). Inflammation and mounting of inflammatory markers are important pathogenic mechanism in development of hypertension (6). Among patients with hypertension, it is well established that pro-inflammatory markers (such as high sensitive C-reactive protein [hs-CRP]) are increased, even after adjustment for potential confounding factors (7). Elevated hs-CRP levels have also been shown to be predictive for the development of hypertension in prehypertensive and normotensive patients (8, 9). Howard et al also considered that C-reactive protein levels are associated with future development of hypertension (10).

In the view of the probable involvement of the acute phase reactants, present study is planned to investigate role of C-reactive protein in development of hypertension.

STUDY AREA

This study was carried out in Department of Biochemistry, Govt. Medical College, Kota, Rajasthan from June 2012 to Dec. 2012. For this study subjects (males) between 30-60 years of age were selected from the general population of Kota district and screened for hypertension.

MATERIAL & METHODS

Hypertension was defined as a reading of ≥140/90 mmHg on three consecutive measurements at least six hours apart. Subjects were distributed on the basis of increasing blood pressure in 2 groups of hypertensive (case) and non-hypertensive (control). Each group comprised of 50 subjects.

Physical Examination: All the subjects had undergone through a complete physical examination. Socio-economic status of every individual was assessed by living standard and monetary status. The family history regarding obesity, diabetes, hypertension, coronary artery disease was carefully recorded by a questionnaire and subjects with Coronary Artery Disease, C.O.P.D., rheumatoid arthritis,

Gastrointestinal or Renal disorder, acute or chronic inflammatory conditions were excluded. Complete physical Examination and clinical history of subjects were also recorded.

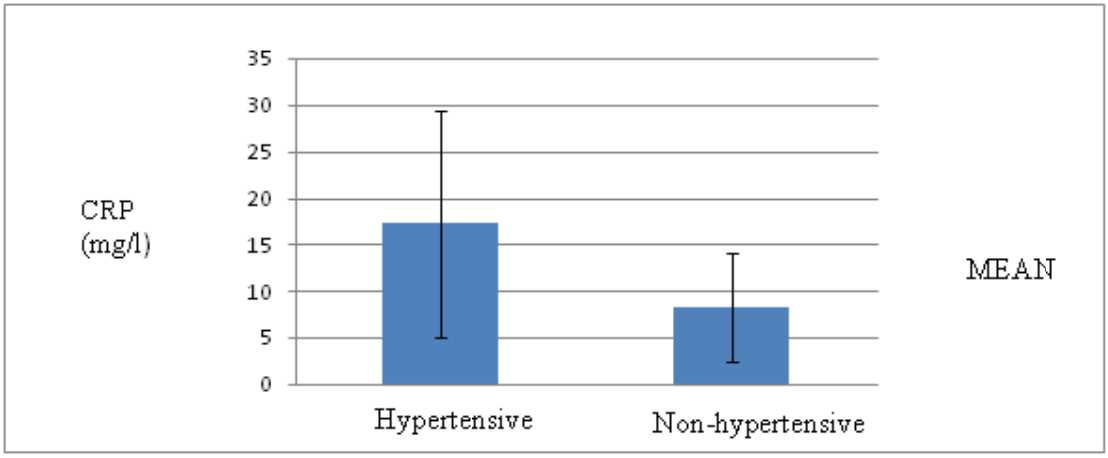
Collection and analysis of sample: After overnight fasting, venous blood of the subjects was drawn from anticubital vein using aseptic techniques. Samples were collected in plain vials. The samples were left standing for one hour and serum was separated.

Investigation: Serum has been used for estimation of C-reactive protein levels, using standard protocol on TRANSASIA EM-360 auto-analyzer.

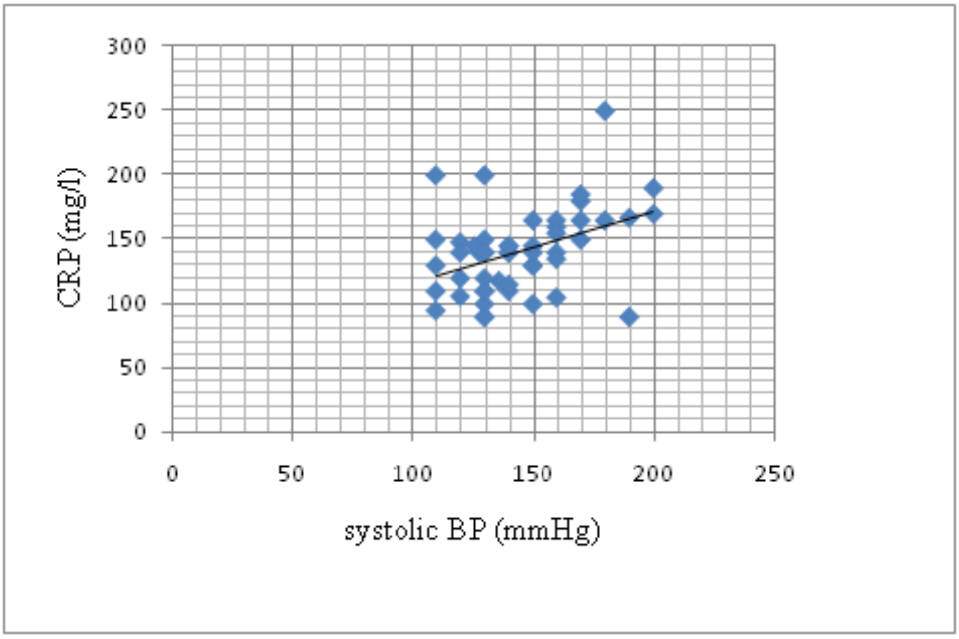
Statistical analysis: Results are expressed as Mean ± SD. Data are analyzed with the help of Microsoft excel 2007, using student's t-test, and strength of association between two variables is measured by Pearson's correlation coefficient (r).

RESULTS

The mean serum CRP levels were significantly higher in patients with hypertension compared with control group of healthy subjects (17.27±12.24mg/l versus 8.28±5.78mg/l, $p<0.0001$). (Table-1 & Graph-1). CRP level showed a significant positive correlation with systolic blood pressure. (Table-2 & Graph-2).



Graph-1 Comparison of C-reactive protein of both groups:



Graph-2 Correlation of systolic blood pressure with C-reactive protein in hypertensive subjects:

Table-1 Comparison of C-reactive protein levels of both Groups:

Parameter	Non-hypertensive subjects	Hypertensive Subjects	Unpaired t test	
			t-score	P-value
C-reactive protein (mg/l)	8.28±5.78	17.27±12.24	4.7	P<0.0001 Significant

Values are Mean ± SD

Table-2 Correlation of systolic blood pressure with C-reactive protein in hypertensive subjects:

Parameter	Systolic Blood Pressure(Hypertensive subjects)	
	r-score	p-value
C-reactive protein	0.43	0.001 Significant

DISCUSSION

Serum-CRP is an acute phase reactant proteins synthesized by hepatocytes under the influence of interleukin-1 originating at sites of inflammation and trauma (11). It has been shown to be beneficial in the clinical evaluation of cardiovascular disorder in adults. CRP and blood pressure are independent determinants of cardiovascular risk, and their predictive value is additive (12).

C-reactive protein & other acute phase reactants like fibrinogen are important positive acute phase proteins & mounting of which may contribute to hypertension. (10, 13)

The present study was conducted on 100 subjects to study the role of C-reactive protein in generation of hypertension. Subjects were distributed on the basis of increasing blood pressure in 2 groups of non-hypertensive and hypertensive. In present study, it was observed that hypertensive subjects had significantly elevated levels of serum C-reactive protein as compare to non-hypertensive subjects, supporting the earlier studies which state that C-reactive protein are associated with future development of hypertension (10)

Essential hypertension is regarded as a multifactorial condition, the onset and severity of which are influenced by both genetic and environmental factors. This fact is supported by various cross-sectional studies that document familial aggregation of the disorder despite different environmental factors. This knowledge is fostering exploration of the molecular and genetic basis of the disease and new approaches to its treatment and prevention (14, 15). It is proven fact that a link between hypertension and inflammation has been established in many research works (16).

CONCLUSION

Hypertension is one of the most common public health problems of the 21st century which increases morbidity and mortality in both developing and developed worlds. It is a positive risk factor in the development of dyslipidaemia, diabetes, cardiovascular disease etc. It is one of the important components of metabolic syndrome, which is a cluster of clinical and metabolic abnormalities including abdominal obesity, insulin resistance, hypertension, dyslipidaemia and all these factors directly increase the risk of CVD.

Recently, chronic low-grade inflammation has been identified as an integral part in the pathogenesis of vascular disease. The presence of inflammatory markers like C-reactive protein, fibrinogen, TNF-α, IL-6 within the body can have a significant role in the development and progression of many disease processes like CVD, cerebrovascular accident, and diabetic complications.

In this study the role of C-reactive protein in hypertensive persons has been explored. C-reactive protein level was found to be significantly elevated in hypertensive subjects as compared to Non-hypertensive subjects. So inflammation has an important role in development of hypertension. It can also be considered that hypertension is an inflammatory process.

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