

# High –sensitivity c-reactive protein in hypertensive patients living in United Arab Emirates

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Date Submitted:7/10/2014

Date Accepted:15/1/2016

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## Abstract

**Background:** ; Inflammation has been found to correlate with endothelial dysfunction and relate to renin-angiotensin system, as a result it has hypothesized that hypertension may be in part an inflammatory disorder. High-sensitivity C- reactive protein( Hs-CRP) is an independent predictor of future cardiovascular events and it predicts risk of incident hypertension.

**Objectives:** of this study is to determine the relationship of the Hs-CRP, a marker of systemic inflammation, with hypertension in hypertensive patients living in United Arab Emirates.

**Patients & Methods:** This study was conducted in, Dubai between May 2008 and April 2009. 86 patients with hypertension and 84 healthy individuals were included in this study. Hs-CRP and lipid profile; Total cholesterol(TC). Triglyceride(TG), Low density lipoprotein(LDL), and High density lipoprotein (HDL) were measured for both groups.

**Results:** Hs-CRP levels were higher in hypertensive patients than in control, but this difference was not statistically significant ( $p=0.217$ ). Frequency of low and high risk levels was significantly higher in hypertensive patients than in control ( $p=0.003$ ), while at average risk levels frequency was higher in control individuals than in patients ( $p=0.003$ ). Overall there was positive association between increasing levels of Hs-CRP and risk of developing hypertension. There was no significant correlation between Hs-CRP and BMI, ( $r=0.6, p=0.447$ ). SBP( $r=0.0.197; p=0.139$ ) and DBP( $r=0.112, p=0.455$ ).

**Conclusion:** High s-CRP is an independent risk factor for hypertension, so it is recommended to be done as part of strategies of global risk assessment.

**Key words:** Hypertension, High-sensitivity C-reactive protein, prevalence, risk levels

## INTRODUCTION

There are a large number of studies done all over the world suggested that inflammation is important in atherosclerosis. Inflammation has also been hypothesized to play a role in the development of hypertension, and cross sectional evidence demonstrates higher hs-CRP levels among those individuals with elevated blood pressure (BP)<sup>1-6</sup>

Large number of prospective trials have shown that inflammatory biomarker, high-s-CRP, is an independent predictor of future cardiovascular events and it predicts risk of incident hypertension and diabetes<sup>7-8</sup>. Inflammation has been shown to correlate with endothelial dysfunction and relate to renin-angiotensin system<sup>9</sup>, as a result it has hypothesized that hypertension may be in part an inflammatory disorder. Scientific studies have found that the higher the hs-CRP, the higher the risk of having heart attack.

Studies done in United states and Europe have also found that elevated levels of high-s-CRP among apparently healthy men and women are a strong predictor of future cardiovascular events, and showed that there is association between sudden cardiac death, peripheral arterial disease and high-s-CRP.<sup>10-13</sup>

Higher level of hs-CRP may increase BP by reducing nitric oxide production in endothelial cells<sup>14</sup>.

The aim of this study was to see whether hs-CRP, a marker of systemic inflammation, is associated with incident hypertension.

## PATIENTS AND METHODS

This study was done in Dubai, UAE, during the period between May 2008-April 2009. 86 hypertensive patients and 84 controlled people were included in this study.

A clinical and demographic data of all patients and control individuals were recorded. Only patients with history of high BP are included in the study. The individual with a history of diabetes mellitus, CAD and chronic kidney disease were excluded.

Inclusion criteria included adult patient living in UAE whether local people or expatriate. Hypertensive patients is defined as either a new physician diagnosis, the initiation of antihypertensive treatment or self-reported systolic BP of at least 140 mmHg or diastolic BP of at least 90 mmHg.

Fasting venous blood samples were taken from each patient and control people, which

was analyzed for hs-CRP and lipid profile including total, cholesterol (TC), Triglyceride (TG), High density lipoprotein (HDL), and Low density lipoprotein (LDL). Hs-CRP was measured by immunoturbidimetric method. Lipid profile was analyzed by enzymatic colorimetric method. All the above tests were done by Olympus AV400 fully automated chemistry analyzer.

Statistical analysis was performed using (SPSS-17) computer Software Program Statistical Package for Social Science. Data were presented as mean, SD, frequency and percentage. The t-test and chi-square test were applied for testing significance using 0.05 as level of significance. A p-value of <0.05 was considered as statistically significant. Spearman's correlation coefficient was determined for correlation and regression between hs-CRP and other parameters in hypertensive patients.

## RESULT

Baseline characteristic of the study population, lipid profile and hs-CRP are shown in **Table I**. There was significant differences in age, BMI, and BP between patients and control subjects ( $P=0.0001$ ).

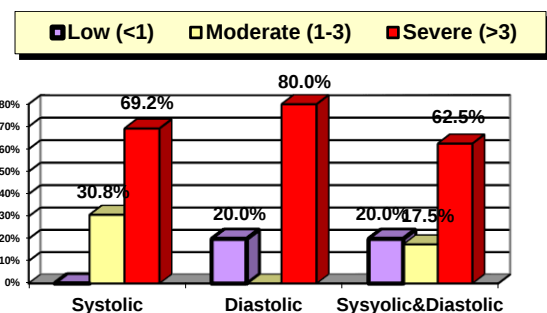
TC and LDL were significantly higher in patients with hypertension ( $P=0.028, 0.002$ ) respectively, while TG and HDL levels did not show significant difference between two groups ( $P=0.466, 0.814$ ) respectively. Hs-CRP levels were higher in hypertensive patients than control ( $6.38 \pm 4.32$ ), but this mean level was not statistically significant.

Frequency of low and high risk levels was significantly higher in hypertensive patients than control people ( $19.3\% \pm 10.5\%$ ;  $62.75 \pm 42.1\%$ ) respectively with ( $P=0.003$ ).

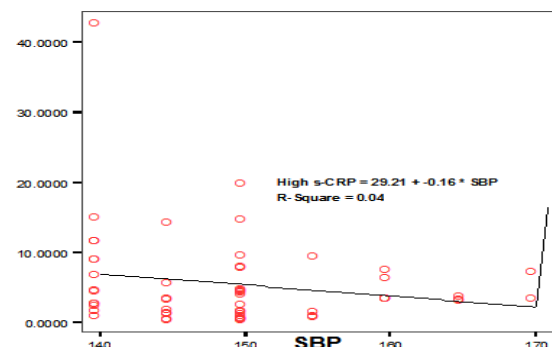
At moderate risk levels frequency was significantly higher in controls than hypertensive patients ( $18.1\% \pm 47.4\%$ ,  $P=0.003$ ) as shown in (**Table II**).

Overall, there was a positive association between increasing levels of hs-CRP and risk of developing hypertension (**Table II**). This study showed that patients with systolic hypertension have moderate to severe levels of high s-CRP, 30.8% and 69.2% respectively. Patients with diastolic hypertension have high s-CRP levels ranged between slight 20% to high level 80%, while those patients with both systolic and diastolic hypertension have high s-CRP ranged from mild, moderate to severe levels as shown in **Figure 1**.

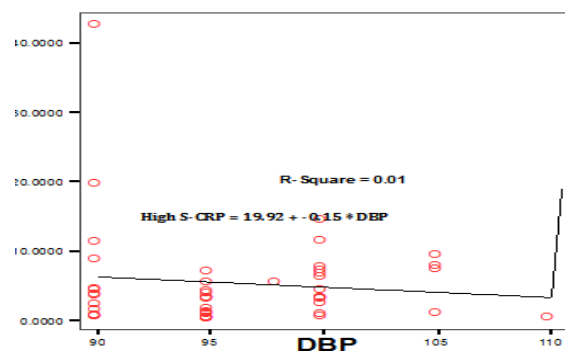
There was no significant correlation between hs-CRP and BMI, ( $r=0.6$ ,  $p=0.447$ ). SBP ( $r=0.0197$ ;  $p=0.139$ ) and DBP ( $r=0.112$ ,  $p=0.455$ ) as shown in Figure 2 and 3 respectively.



**Figure 1** The high S-CRP and type of hypertension..



**Figure 2.** The correlation between high sensitive C-Reactive protein and systolic hypertension ( $r= -0.197$ ,  $P=0.139$ ).



**Figure 3.** The correlation between high sensitive C-Reactive protein and systolic hypertension ( $r= -0.197$ ,  $P=0.139$ ).

**Table 1. The Clinical Characteristic and Demographic data of Control and Patients with Hypertension.**

|                   | Patients No (%) | Control No(%) | P value |
|-------------------|-----------------|---------------|---------|
| Age (years)       | 47.6±9.0        | 37.40±6.54    | 0.0001* |
| Males             | 59 (68.6%)      | 70 (83.3%)    | 0.076   |
| Females           | 27 (31.4%)      | 14 (16.7%)    |         |
| BMI               | 31.82±6.21      | 29.68±4.65    | 0.050*  |
| SBP               | 142.63±12.40    | 123.86±9.66   | 0.0001* |
| DBP               | 89.42±8.92      | 79.29±5.69    | 0.0001* |
| Total Cholesterol | 218.16±33.59    | 201.98±38.60  | 0.028*  |
| Triglycerides     | 167.83±97.61    | 155.74±81.33  | 0.508   |
| HDL               | 45.96±9.75      | 46.47±13.38   | 0.814   |
| LDL               | 146.24±29.18    | 123.84±37.73  | 0.002*  |
| High sCRP         | 6.38±9.77       | 4.32±4.29     | 0.217   |

**Table 2. The percentage distribution of different risk categories of control and hypertensive patients.**

| High s-CRP      | Patients No (%) | Control No(%) | P value |
|-----------------|-----------------|---------------|---------|
| Low (<1)        | 17 (19.3%)      | 9(10.7%)      | 0.003*  |
| Moderates (1-3) | 16 (18.1%)      | 38 (45.2%)    |         |
| Severe (>3)     | 53 (62.6%)      | 37 (44.1%)    |         |

## DISCUSSION

Despite the fact that up to 50 millions US individuals are affected ,the etiology of hypertension often remained unclear<sup>15</sup>. Although hypertension awareness, treatment, and control rates have increased during the past three decades, the identification of individuals at risk for hypertension remains a high priority<sup>15</sup>.

The study data showed the prevalence of undesirable risk levels of hs-CRP was higher in both low and sever ranges, and the difference was significant. Moreover the hs-CRP levels was significantly higher in healthy individual in moderate risk range. A possible explanation is that, those control individuals in moderate risk group, could have BMI higher than hypertensive patients (42.9%) of those people are overweight in comparison with( 34%) in hypertensive patients ,or could have another risk factors such as undiscovered diabetes or renal impairment, which could cause such a level in hs-CRP.The study provides evidence that levels of hs-CRP is independently increased in patients who are without baseline cardiovascular factors .Diabetes mellitus ,renal disease ,coronary artery disease and stroke which could be a cause of hs-CRP. This result is consistent to what

mentioned in JNC7.<sup>15</sup> .High s-CRP has been reported to decrease production of nitric oxide by endothelial cells and thus might indirectly promote vasoconstriction and up regulating angiotensin type-I receptor expression, affecting the renin angiotensin system and contributing to the pathogenesis of hypertension,<sup>16,17,18</sup>

The data showed that hs-CRP has been associated more with DBP than SBP, this result is inconsistent with study done by Sesso,et all ,who showed that CRP has been more strongly associated with systolic BP than DBP<sup>19</sup>.

The current data provide evidence that hs-CRP is independent risk factor for high BP, but we cannot confirm that ,because the study showed also high highs-CRP in overweight and obese control individual, so more studies are required to clarify this issue, similar finding have been reported by Haider et al.<sup>20</sup>

## Conclusion and recommendations;

1-Hs-CRP is an independent factor and can be useful parameter to differentiate hypertensive patient from normal individual especially those who are not overweight or obese.2-Hs-CRP test should be recommended to be routinely done in hypertensive patient as part of strategies of global risk assessment.

## REFERENCES

1. Ford ES, Giles WH, Serum C-reactive protein and fibrinogen concentrations and self-reported angina pectoris and myocardial infarction: findings from National Health and Nutrition Examination Survey III. *J Clin Epidemiol.* 2000;53:95-102.
2. Rhode LE, Hennekens CH, Ridker PM. Survey of C-reactive protein and cardiovascular risk factors in apparently healthy men. *Am J Cardiol.* 1999;84:1018-1022
3. Bermudez EA, Rifai N, Buring J, Manson JE, Ridker PM. Interrelationships among circulating interleukin-6, C-reactive protein, and traditional cardiovascular risk factors in women. *Arterioscler Thromb Vasc Biol.* 2002;22:1668-1673
4. Chae CU, Lee RT, Rifai N, Ridker PM. Blood pressure and inflammation in apparently healthy men. *Hypertension.* 2001;38:399-403
5. Yamada S, Gotoh T, Nakashima Y, et al. Distribution of serum C-reactive protein and its association with atherosclerotic risk factors in a Japanese population: Jichi Medical School Cohort Study. *Am J Epidemiol.* 2001; 153:1183-1190
6. Bautista LE, Lopez-Jaramillo P, Vera LM, et al. Is C-reactive protein an independent risk factor for essential hypertension? *J Hypertens.* 2001;19:857-861.
7. Libby P, Ridker PM, Maseri A. Inflammation and Atherosclerosis. *Circulation.* 2002; 105:1135-43.
8. Ridker PM. C-reactive protein and the prediction of cardiovascular events among those at intermediate risk: moving an inflammatory hypothesis toward consensus. *J Am Coll Cardiol.* 2007; 49(21):2129-38.
9. Braiser AR, Recinos A, 3rd, Eledrisi MS. Vascular inflammation and the renin-angiotensin system. *Arterioscler Thromb Vasc Biol.* 2002;22:1257-1266.
10. Ridker PM, Hennekens CH, Buring JE, Rifai N. C reactive protein and other markers of inflammation in the prediction of cardiovascular disease in women. *N Engl J Med.* 2000;342:836-43.
11. Ridker PM, Buring JE, Shih J, Matias M, Hennekens CH. Prospective study of C-reactive protein and the risk of future cardiovascular events among apparently healthy women. *Circulation.* 1998;98:731-3.
12. Danesh J, Whincup P, Walker M, Lennon L, Thomson A, Appleby P, et al. Low grade inflammation and coronary heart disease: prospective study and updated meta-analyses. *BMJ* 2000;321:199-204.
13. Mendall MA, Strachan DP, Butland BK, Ballam L, Morris J, Sweetnam PM, et al. C-reactive protein: relation to total factors in men. *Eur Heart J* 2000;21:1584-90.
14. Verma S, Wang CH, Li SH, et al. A self-fulfilling prophecy: C-reactive protein attenuates nitric oxide production and inhibits angiogenesis. *Circulation.* 2002;106:913-919.
15. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA.* 2003;289:2560-2571.
16. Wang CH, Li SH, Weisel rd, et al. C-reactive protein upregulates angiotensin type I receptors in vascular smooth muscle. *Circulation.* 2003;107:398-404
17. Verma S, Anderson TJ. The ten most commonly questions about endothelial function in cardiology. *Cardio Rev.* 2001;9:250-252
18. Ross. Atherosclerosis; an inflammatory disease. *N Engl J Med.* 1999;340:115-126
19. Sesso HD, Stampfer MJ, Rosner B, et al. Systolic and diastolic blood pressure, pulse pressure, and mean arterial pressure as predictors of cardiovascular disease risk in men. *Hypertension.* 2000;36:801-807
20. Haidari, M, Javadi E, Sadeghi B, Hajilooi, M, Ghanbili J. Evaluation of C-reactive protein, a sensitive marker of inflammation, as a risk factor for stable coronary artery disease. *Clin Biochem.* 2001;34(4):309-15