

## HYPERTENSION AND OBESITY IN RELATION TO HIGH SENSITIVITY C-REACTIVE PROTEIN AND LIPID PROFILE IN IRAQI PATIENTS

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### Abstract

#### Introduction:

High sensitive C-reactive protein (hs-CRP) is one of new inflammatory markers which has been proposed as independent risk factor for cardiovascular disease, and it is positively associated with body weight. Little is known, however, about the utility of (hs-CRP) and other biomarkers in obese hypertensive Iraqi patients.

#### Objectives:

To examine the hypothesis that there is a relation between obesity, hypertension and a chronic low-grade inflammatory status (represented by high hs-CRP).

#### Patients and Method:

A total number of 99 patients stratified according to hypertension and obesity into two groups:

**1. Obese hypertensive:** Body mass index (BMI > 30 kg/m<sup>2</sup> and blood pressure (BP) >140/90 mmHg ± history of taking anti hypertensive medications), n = 65, Age = (56.02 ± 4.379) years, BMI = (35.68 ± 4.78) kg/m<sup>2</sup>.

**2. Over weight normotensive:** (BMI > 25 kg/m<sup>2</sup> and < 30 kg/m<sup>2</sup>, BP < 140/90 mmHg), n = 34, Age = (56.44 ± 3.17) years, BMI = (26.06 ± 3.05) kg/m<sup>2</sup>.

Assessment of (hs-CRP) and lipid profile (total serum cholesterol (s.chol), serum triglyceride (s.TG), low density lipoprotein (LDL), and high density lipoprotein (HDL) was done.

#### Results:

The (Mean ± SD) of (hs-CRP) in the patients and controls were (5.74 ± 2.15) mg/l and (2.14 ± 0.85) mg/l respectively, (P < 0.001). The (Mean ± SD) of cholesterol for cases and control were (215.17 ± 33.3) mg/dl and (197.81 ± 27.3) mg/dl respectively, (P < 0.05). For HDL were (51.31 ± 7.45) mg/dl and (54.63 ± 5.091) mg/dl respectively, (P < 0.05). For LDL were (136.9 ± 32.87) mg/dl and (117.81 ± 24.73) mg/dl respectively, (P < 0.005). For BMI were (35.68 ± 4.78) kg/m<sup>2</sup> and (26.06 ± 3.05) kg/m<sup>2</sup> respectively, (P < 0.001).

#### Conclusions:

There is an elevation of serum level of (hs-CRP) in hypertensive obese subject in comparison with low levels in control group.

**Key words:** hypertension, hs-CRP, obesity, overweight, lipid profile.

### Introduction

The number of patients with hypertension is likely to grow as the population ages [1]. An increased incidence of obesity will also increase the number of hypertensive individuals [1]. Controlled hypertension defined as a level below 140/90 mmHg [2]. Hypertension will likely remain the most common risk factor for heart attack and stroke [3].

Definition of hypertension have been suggested by the seventh report of the Joint National Committee (JNC 7) [2]. Based upon

the average of two or more properly measured readings at each of two or more visits, the following classification is used [2].

- Normal blood pressure: systolic < 120 mmHg and diastolic < 80
- Prehypertension: systolic 120-139 or diastolic 80-89.
- Hypertension: systolic ≥ 140 or diastolic ≥ 90

The systolic pressure is the greater predictor of risk in patients over the age of 50 to 60 years [4].

Essential hypertension (idiopathic or primary) has been attributed to a number of risk factors: genetic factors, increased salt intake ,excessive alcohol intake, weight gain, more common and more severe in blacks.

Secondary hypertension due to a known cause( Primary renal disease, oral contraceptive, pheochromocytoma, primary hyperaldosteronism, Renovascular disease, Cushing's syndrome), other endocrine disorders (hypothyroidism, hyperthyroidism and hyperparathyroidism), coarctation of aorta [5]. Hypertension is a major risk factor for premature cardiovascular disease [6-7], for stroke [8] and for chronic renal insufficiency and end- stage renal disease [9-10]. The increase in risk begins as the blood pressure rises above110/75 mmHg [11-12].Obesity and insulin resistance are, with hypertension, components of the metabolic syndrome, which is associated with an increased risk of type 2 diabetes and cardiovascular disease [13-14].

The mechanism by which obesity raises the BP is not well understood. The relation between obesity and hypertension is important clinically because weight loss can lead to a significant fall in systemic BP [15-16], fall in lipid level and decrease cardiovascular risk [17], partial reversal of left ventricular hypertrophy[18] and improve quality of life [19] and lower risk of developing diabetes [20].

**CRP** is an acute phase protein that is produced predominantly by hepatocytes under the influence of cytokines such as interleukin(IL)-6 and tumor necrosis factor-alpha [21], studies have shown a significant association between elevated serum or plasma concentrations of CRP and the prevalence of underlying atherosclerotic vascular disease [22]. For the determination of cardiovascular risk, low, average, and high risk values were defined as < 1, 1 to 3, and > 3 mg/L; 10 mg/L should initiate a search for a source of infection or inflammation [23].

Increased serum CRP correlates with the presence of cardiovascular risk factors [24]. Serum CRP is significantly associated with age, smoking, hypertension, body mass index, the metabolic syndrome, incident type 2 diabetes, reduced exercise frequency, and the serum concentrations of homocysteine and

lipoprotein (a) [22-23-24].

**Objectives**

Examine the hypothesis that there is a relation between obesity, hypertension and a chronic low-grade inflammatory status (represented by high hs-CRP).

**Patients and Method**

A total of 99 patients(male and females), age range between 47-66 years attending to Al-Yermook teaching hospital during period from Dec 2006-March 2007 was stratified according to hypertension and obesity into 2 groups Table (1).

**a. Obese hypertensive** (BMI > 30 kg/m<sup>2</sup> and blood pressure ≥ 140/90 mmHg ± history of taking anti hypertensive medications), [n = 65, Age = (56.02 ± 4.37) years, BMI = (35.68 ± 4.78)kg/m<sup>2</sup>.

**b.Overweight normotensive** (BMI > 25kg/m<sup>2</sup> and < 30 kg/m<sup>2</sup>, blood pressure ≤ 140/90] mmHg), [n = 34, Age = 9 56.443.17) years, BMI = (26.02 ± 3.050) kg/m<sup>2</sup>.

Exclusion criteria was patients with IHD (ischemic heart disease), congestive heart failure, renal failure, inflammatory diseases such as rheumatoid arthritis.

Biomarker test assessment done for (hs-CRP), lipid profile (total serum cholesterol, serum triglyceride, low density lipoprotein, high density lipoprotein) also done.

t-Test was used to asses the difference in the mean value of selected biomarkers between the study groups.

The correlation coefficient (R) test is used to describe the association between the different studied biomarkers, for both tests p value < 0.05 was considered statistically significant.

**Table (1)**  
**Number of study subjects according to hypertension and obesity.**

		Hypertension		Total
		Normotensive	Hypertensive	
Obesity	Overweight (non obese)	34		34
	Obese		65	65
Total		34	65	99

## Results

- **Obese** (BMI  $\geq 30$  kg/m<sup>2</sup>) Hypertensive patients, number = 65.
- **Overweight** (BMI  $> 25$ kg/m<sup>2</sup> and  $< 30$  kg/m<sup>2</sup>) normotensive (Controls), number=34.

There is no significant difference in mean age, and serum triglycerides level between patients and control groups (p value  $> 0.05$ ).

Mean value of BMI is highly elevated in patients group compared to control group (P  $< 0.001$ ) Table (2). Mean value of CRP is significantly elevated in patients group compared to control group (P  $< 0.001$ ) Table (2). Total cholesterol concentration is significantly higher in patients group compared to control group (P  $< 0.05$ ) Ttable (2). Mean value of HDL is slightly lower in patients group compared to control group (p  $< 0.05$ ) Table (2) .Mean value of LDL is significantly higher in patients group than control group (p  $< 0.05$ ) Table (2).

**Table (2)**

*Mean  $\pm$  SD values of age , triglycerides, BMI, CRP, cholesterol, HDL, and LDL in patients (n =65) and control (n =34) subjects.*

Serum level	patients group	Control group	P value
Age (years)	56.02 $\pm$ 4.379	56.44 $\pm$ 3. 17	0.628
BMI (kg/m <sup>2</sup> )	35.68 $\pm$ 4.78	26.06 $\pm$ 3.05	$< 0.001$
CRP(mg/l)	5.74 $\pm$ 2.15	2.14 $\pm$ 0.85	$< 0.001$
Cholesterol (mg/dl)	215.17 $\pm$ 33.3	197.81 $\pm$ 27.3	$< 0.05$
TG (mg/dl)	134.75 $\pm$ 52.33	126.88 $\pm$ 49.705	0.48
HDL (mg/dl)	51.31 $\pm$ 7.45	54.63 $\pm$ 5.091	$< 0.05$
LDL (mg/dl)	136.91 $\pm$ 32.87	117.81 $\pm$ 24.73	$< 0.005$

## Discussion

When hypertensive patients are compared to normal, one of the major differences is an increased prevalence of obesity [25, 26]. Furthermore, weight gain appears to be a main determinant of the rise in blood pressure (BP) that is commonly seen with aging [27]. In addition to the risk of hypertension, obesity further enhances total cardiovascular risk by increasing LDL-cholesterol levels, reducing HDL-cholesterol levels, diminishing glucose tolerance, and predisposing to the development of left ventricular hypertrophy (independent of

the systemic BP) [28, 29].

The importance of these associations and their associations with inflammation are presented in the present study. It was estimated that excess body weight (including overweight and obesity) accounted for approximately 26 percent of cases of hypertension in men and 28 percent in women and for approximately 23 percent of cases of coronary heart disease in men and 15 percent in women [30] .some recent epidemiological studies showed that the presence of a chronic low grade inflammatory status can anticipate the future development of hypertension [31].This observation suggests that the increase in plasma levels of inflammatory mediators observed among hypertensive patients cannot be solely attributed to the vascular damage induced by high blood pressure [32].

In our study there is statistically significant relation between hypertension and CRP in obese hypertensive and overweight normotensive subjects respectively) and this is concordant with the results obtained by Some studies which showed that (hs CRP) was increased in patients with essential hypertension and no evidence of CVD [33]. More recently, Sesso et al. showed that, in a cohort of 20.525 females Study, the levels of (hs-CRP) predicted the development of hypertension [34]. Our results also indicate that CRP is strongly associated with BMI and these results are compatible with previous studies as seen in study done by (A. Elisabeth et al) who found that C-RP strongly associated with BMI, waist circumference and insulin resistance including hypertension [35].

## Conclusions

We concluded that; There is an elevated serum level of (hs-CRP) in hypertensive and obese subjects in comparison with low levels in overweight subjects (control group).

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**الخلاصة****المقدمة:**

عدة واسمات التهابية جديدة قد ظهرت كمنبه قوي حول امراض القلب والاعوية الدموية في الاشخاص الاصحاء وغير الأصحاء. إحدى هذه الواسمات هو البروتين التفاعلي نوع C العالي الحساسية (hs-CRP) والذي يعتبر عامل خطورة مستقل لامراض القلب والاعوية الدموية ويتعلق ايجابياً مع وزن الجسم . ولكن المعلومات حول استخدام هذا البروتين وشاكلة الدهون في المرضى العراقيين الذين يعانون من السمنة وارتفاع الضغط هي معلومات قليلة.

**هدف البحث**

- لفحص النظرية القائلة بوجود علاقة بين السمنة وارتفاع الضغط من جهة والحالة الالتهابية المزمنة المنخفضة الدرجة من جهة اخرى والتمثلة بارتفاع نسبة (hs-CRP).

**طريقة البحث:**

أشخاص الدراسة تم تقسيمهم مجموعتين:  
 أ. مجموعة المرضى (اشخاص مصابون بالسمنة وارتفاع ضغط الدم، العدد = 65).  
 ب. المجموعة الضابطة (اشخاص مصابين بزيادة الوزن و ضغط دم طبيعي، العدد = 34)  
 لكلتا المجموعتين تم قياس شاكلة الدهون والبروتين التفاعلي نوع C العالي الحساسية hs-CRP في مصل الدم. اختبار (t) استعمل لتقييم الاختلاف في قيمة المتوسط للفحوصات المختارة بين المجموع، واستعمل عامل الارتباط (r) لفحص الارتباط بين الواسمات الحيوية المختلفة.

**النتائج:**

(المتوسط + الانحراف المعياري) للبروتين التفاعلي نوع C العالي الحساسية للمجموعة الأولى كان بالنسبة للمرضى والمجموعة الضابطة  $1 \text{ mg} (2.1 \pm 5.74)$  و  $1 \text{ mg} (0.8 \pm 2.1)$  على التوالي وقيمة  $(P < 0.001)$ . (المتوسط  $\pm$  الانحراف المعياري) للكوليسترول بالنسبة للمرضى والمجموعة الضابطة كانت  $1 \text{ mg/dI} (33.0 \pm 215.1)$  و  $1 \text{ mg/dI} (27.3 \pm 197.8)$  على التوالي وقيمة  $(P < 0.001)$  للكوليسترول

العالي الكثافة كانت  $(51.3 \pm 7.4)$  mg/dI  
و  $(54.6 \pm 5.0)$  mg/dI على التوالي وقيمة  
( $P < 0.001$ ) وللكوليسترول القليل الكثافة كانت  
 $(117.8 \pm 24.5)$  mg/dI و  $(136.9 \pm 32.8)$  mg/dI  
على التوالي وقيمة ( $P < 0.005$ ) زلمنسب كتلة الجسم كانت  
على  $(26.0 \pm 3.0)$  kg/m<sup>2</sup> و  $(35.6 \pm 4.7)$  kg/m<sup>2</sup>  
التوالي وقيمة ( $P < 0.001$ ).

### الاستنتاج

هناك ارتفاع في قيمة hs-CRP في الاشخاص  
المصابين بارتفاع ضغط الدم مقارنة بالاشخاص الذين لا  
يعانون من ارتفاع ضغط الدم و ارتفاع في قيمة hs-  
CRP في الأشخاص المصابين بالسمنة مقارنة بالأشخاص الذين  
يعانون من زيادة الوزن.