RELATIONS OF PLASMA HOMOCYSTEIN AND HS-CRP CONCENTRATIONS TO SOME RISK FACTORS IN PATIENTS WITH PRIMARY HYPERTENSION

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SUMMARY

Objectives: *(1) Evaluating some of the risk factors in patients with primary hypertension treated at Military Hospital 103. (2) Determing the correlation between HCy and Hs-CRP levels and some risk factors in primary hypertensive patients.* ***Subjects and method:*** *92 patients with primary hypertension were recruited in the present study. Some risk factors, and plasma HCy, Hs-CRP concentrations of all these patients were examed.* ***Results:*** *The risk factors consisted of overweight and obesity (45.7%), family history (42.4%), smoking (35.9%), alcohol abuse (38%), high salt intake (63%), dyslipidemia (76.1%). There was a positive correlation between plasma Homocysteine, Hs-CRP levels and age; HCy level and smoking and high salt intake. No correlation was found between plasma Homocysteine; Hs-CRP and BMI, alcohol abuse, or dyslipidemia.* ***Conclusion:*** *the present study provided a new evidence of relations of of plasma Homocysteine and Hs-CRP concentrations to some risk factors in patients with primary hypertension.*

Keywords: *Risk factors, primary hypertension, Homocysteine, Hs-CRP.*

1. INTRODUCTION

Hypertension and atherosclerosis are closely related. Based on empirical evidence, atherosclerosis associated with hyperhomocysteinemia due to endothelial dysfunction and platelet activation, thrombosis formation [8]. CRP has been shown to be a pro-inflammatory factor in atherosclerosis and significantly increase in hypertensive patients [5]. Hypertension and atherosclerosis are a complex pathological process involving a number of risk factors. Homocysteine and Hs-CRP are one of the first agents to damage the arterial endothelium, triggering atherosclerosis in hypertension and associated with a number of risk factors. Thus, the aim of the current study was *to:*

(1) Evaluate some of the risk factors in patients with primary hypertension treated at Military Hospital 103.

(2) Find out the correlation between HCy and Hs-CRP levels and some risk factors in primary hypertensive patients.

2. METERIALS AND METHODS

2. 1. Research subjects

*** The hypertensive group:** 92 patients with primary hypertension who were examined and treated at Departments of Outpatient and Department of Cardiology, Military Hospital 103 from March 2015 to June 2016.

- Criteria for selecting patients: Patients were diagnosed with hypertension according to WHO; Patients with primary hypertension and patients agreed to participate in the research

- Exclusive criteria: Patients with

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secondary hypertension; they had acute or suspected infection syndrome; they had other chronic diseases such as rheumatoid arthritis, systemic diseases and patients with decompensated cirrhosis, chronic renal failure, malignancy tumors.

* **The control group**: A total of 30 randomized, age-matched and sex-matched healthy subjects were measured for HCy and Hs-CRP levels. The control group is only for the reference number of HCy and Hs-CRP levels in the diseased group.

2.2. Research contents and methods

* **Study design:** a prospective, descriptive, cross-sectional, comparative study.

* **Research contents**

- Patients were asked and examined, measured arm blood pressure, did blood and urine tests and identified risk factors for hypertension such as age, sex, smoking, alcohol consumption, high salt intake, family factors, dyslipidemia and overweight, obesity.
- Quantified HCy and Hs-CRP plasma.

+ Plasma HCy: took 3 ml of anticoagulant blood with EDTA, took plasma for testing. Testing Technique: Immune fluorescence on the AxSYM system of Abbot carried out at Biochemistry department – Military Hospital 103.
+ Quantification of Hs-CRP: Based on the principle of measuring the opacity of the antigen-enhanced antibody on latex granules, performed on AU 640 OLYMPUS machine at Biochemistry Department, Military Hospital 103.
+ Determination of HCy and Hs-CRP levels in the control group: Patients' values > X + 2SD of control group were determined to be elevated.

2.3. Data analysis

Data was analyzed by using Medical Statistic method with SPSS 20.0 software. Significant differences were defined at $p<0,05$.

3. RESULTS

The study group consisted of 92 patients with primary hypertension (48.9%), 47 women (51.1%), mean age 60.08 ± 13.66, mean BMI 23.24 ± 2.48 .

3. 1. Risk factors of hypertension

Table 3.1 shows that common risk factors in patients with hypertension were smoking, drinking alcohol, high salty intake, family factors and dyslipidemia. Dyslipidemia accounted for 76.1%, while smoking accounted for the lowest percentage (35.9%).

Among patients with dyslipidemia, the number of patients with hypercholesterolemia was highest (52.2%), and patients with increased LDL-C (23.9%) and hypertriglyceridemia (25.0%) accounted for the lowest proportion (table 3.2)

Table 3.1. The percentage of patients with risk factors (n = 92)

Risk factors	Number of patients	Percentage (%)
Smoking	33	35.9
Drinking alcohol	35	38.0
High salt intake	58	63.0
Family factors	39	42.4
Overweight, obesity	42	45.7
Dyslipidemia	70	76.1

Table 3.2. Characteristics of dyslipidemia in hypertensive patients

Dyslipidemia	Number of patients	Percentage (%)
Increased cholesterol	48	52.2
Increased Triglyceride	23	25.0
Increased LDL-C	22	23.9
Reduced HDL-C	32	34.8

3.2. Relations of Hcy, Hs-CRP levels to risk factors of hypertension

Mean values of Hs-CRP and HCy among age groups were significantly different in both the control and the diseased groups (table 3.3). Table 3.4 indicates that the mean values of HCy and Hs-CRP between men and women in the different groups were not statistically significant. There was a statistically significant difference in the proportion of Homocysteine between male and female. The increase of Hs-CRP rate between men and women were similar.

Table 3.3. Relations of Hs-CRP and HCy plasma concentrations to age

Group		Hypertensive group (n=92)	
		n	X ± SD
Hs-CRP	< 60	46	2.03 ± 1.61
	≥ 60	46	2.88 ± 2.25
P		< 0.05	
HCy	< 60	46	12.32 ± 7.09
	≥ 60	46	23.17 ± 18.61
P		< 0.05	

Table 3.4. Relations of mean values of HCy concentration hs-CRP to genders

Index	Male (n=45)	Female(n=47)	p
HCy (µmol/l)	20.76±16.28	14.85±13.26	> 0.05
Hs-CRP (mg/l)	2.32±1.96	2.58±2.03	> 0.05
Increased Hcy, n (%)	19 (42.2%)	10 (21.3%)	< 0.05
Increased Hs-CRP, n (%)	10 (22.2%)	16 (34.0%)	> 0.05

Table 3.5. Relations of serum Hs-CRP, Hcy levels to body weights

BMI	HCy (µmol/l)		hs-CRP(mg/l)	
	X ± SD	Increased n (%)	X ± SD	Increased n (%)
Normal (n=50)	17.15 ± 13.85	16 (32.0)	2.31 ± 1.91	12 (24.0)
Overweight and obesity (n=42)	18.44 ± 16.46	13 (31.0)	2.62 ± 2.09	14 (33.3)
p	> 0.05	> 0.05	> 0.05	> 0.05

The research group had normal and overweight and obese BMI. HCy and Hs-CRP plasma levels increased in overweight and obese patients. The difference was not statistically significant. Hs-CRP and HCy rates in both normal and overweight and obese group were similar (table 3.5).

The smoker group had significantly higher plasma HCy concentration and rate than those of the non-smoker group ($p < 0.05$). The smoker group had insignificantly higher plasma Hs-CRP concentration and rate than those of the non-smoker group ($p > 0.05$) (table 3.6).

Table 3.6. Relations of Hs-CRP, HCy serum to smoking

Smoking	HCy (µmol/l)			Hs-CRP (mg/l)		
	Increased n (%)	Normal n (%)	X ± SD	Increased n (%)	Normal n (%)	X ± SD
Yes (n=33)	16 (48.5)	17 (51.5)	23.6 ± 18.14	10 (30.3)	23 (69.7)	2.51 ± 2.25
No (n=59)	13 (22.0)	4 (78.0)	14.46±11.93	16(27.1)	43 (72.9)	2.42 ± 1.85
OR	3.33			1.17		
p	< 0.05		< 0.05	> 0.05		> 0.05

Table 3.7. Relations of Hs-CRP, HCy serum to alcohol consumption

Drinking alcohol	HCy (µmol/l)			Hs-CRP (mg/l)		
	Increased n (%)	Normal n(%)	X ± SD	Increased n (%)	Normal n(%)	X ± SD
Yes (n=35)	12 (34.3)	23(65.7)	21.82±18.20	9(25.7)	26 (74.3)	2.54±2.13
No (n=57)	17(29.8)	40 (71.2)	15.24 ±12.21	17 (29.8)	40 (70.2)	2.40±1.91
OR	1.23			0.81		
p	> 0.05		> 0.05	> 0.05		> 0.05

Table 3.8. Relationship between Hs-CRP, HCy serum and salty diet

Eating salty	HCy (µmol/l)			Hs-CRP (mg/l)		
	Increased n (%)	Normal n(%)	X ± SD	Increased n (%)	Normal n (%)	X ± SD
Yes (n=58)	20 (34.5)	38 (65.5)	19.97±17.23	18 (31.0)	40(69.0)	2.51± 1.84
No (n=34)	9 (26.5)	25 (73.4)	13.94 ± 9.30	8 (235)	26 (765)	2.35 ± 2.25
OR	1.59			1.46		
p	> 0.05		< 0.05	> 0.05		>0.05

Table 3.9. Relations of Hcy, Hs-CRP serum to non- dyslipidemia and at least one lipid ingredient dyslipidemia (n = 92).

Dyslipidemia	HCy (µmol/l)			Hs-CRP (mg/l)		
	Increased n (%)	Normal n(%)	X ± SD	Increased n (%)	Normal n (%)	X ± SD
Yes (n=70)	26 (37.1)	44 (62.9)	18.91±15.45	22 (31.4)	48 (68.6)	2.45±1.80
No (n=22)	3 (13.6)	19 (86.4)	14.03±13.25	4 (18.2)	18 (81.8)	2.47 ±2.56
OR	3.74			2.06		
p	< 0.05		> 0.05	> 0.05		> 0.05

Talble 3.7 shows that the drinker group had insignificantly higher plasma HCy concentration and rate than the non-drinker (p> 0.05). The drinker group had a insignificantly higher plasma Hs-CRP concentration and rate compared with the non-drinker (p> 0.05).

Table 3.8 indicates that the salty diet group had insignificantly higher increased rate of plasma HCy than the non-eating salty (p> 0.05) but had a significantly higher concentration (p <0.05). The salty diet group had insignificantly higher concentration and increased rate of plasma Hs-CRP than the non-eating salty (p> 0.05).

Mean values of HCy and Hs-CRP levels in patients with or without dyslipidemia were not statistically significant. Patients with dyslipidemia increased the rate of Homocysteine but did not increase the incidence of Hs-CRP (table 3.9).

4. DISCUSSION

4.1. Some characteristics of risk factors of hypertension

The research group had an average BMI of 23.24 ± 2.48 in which overweight and obese patients accounted for 45.7%; smoking pipe or tobacco accounted for a quite high proportion (35.9%) 100% were male most had smoked for many years; high salt intake accounted for a high rate of 63% family history made up 42.4%; Dyslipidemia accounted for a very high rate of 76.1%. The research by Bui Van Tan and Dinh Thi Nguyet (2010) on risk factors for hypertension in primary hypertensive patients showed that the highest risk factors were lipid metabolism (78.4%) high salt intake compared to those who were around (26.6%) regular drinking (14.1%) smoking (11.6%) [1]. According to Mai Tien Dung's research (2015) overweight and obesity accounted for 52.8% with an average BMI of 24.43 ± 0.88 with up to 80% of patients had a history of smoking with male was 100% female was 0% [2]. According to the research by Hisao Kumakura at al. (2015) BMI average was 22.4 and the highest was 24.5 the lowest was 20.1; 79.6% were smokers. [7] Thus the proportion of risk factors in the studies was different but the most common in hypertensive patients was lipid disorders which was the lead among hypertensive patients giving a warning poor blood lipid control should be considered.

4.2. Relations of HCy concentration Hs-CRP blood to risk factors

The study also showed an increase in HCy and Hs-CRP levels correlated with age but gender. Results of the study were similar to some authors: Nguyễn Văn Tuấn (2016) did not find any correlation between the HCy increase and age and gender in the diseased group [3]. Mai Tiến Dũng (2015) did not find any correlation between HCy and Hs-CRP levels and age sex ratio [2]. The age in our study group was correlated with the increase of HCy and Hs-CRP serum possibly due to age differentiation among the authors. Age and gender had important effects on blood HCy levels. The NHANES study Framingham found that mean blood HCy levels were significantly higher in men than those in healthy women increasing with age correlating with blood creatinine concentrations that may be related to HCy and creatinine metabolism.

Mean plasma concentrations and increasing rate of HCy and Hs-CRP in the overweight group (BMI >23) were significantly higher but not significantly different from the non-overweight group (BMI <23) (p> 0 05). The study by Nguyen Van Tuan and et al (2016) showed that HCy levels were correlated with BMI [3]. The study by Mai Tien Dung (2015) found no correlation between Hs-CRP and BMI [2]. Our results differ from Nguyen Van Tuan because our sample size was not large enough to evaluate this correlation. Fatty tissue is known to be responsible for the production of adipokines such as leptin adiponectin resistin...which are important in obesity. In obese adults adipocytes increase in size excreting many proinflammatory cytokines such as IL6 TNF-α. Increasing the levels of IL6 in the blood will induce more Hs-CRP from the liver. Obesity often associates with dyslipidemia fat cells release many proinflammatory cytokines causing damage to the blood vessels and atherosclerosis leads to an increase in blood HCy.

The levels and rates of increasing HCy in the smoker group were statistically significantly higher than in the non-smoker group (p <0.05) indicating a link between smoking and HCy. The concentration and rate of Hs-CRP increase in smokers were 2.51 ± 2.25 mg/l higher than those of non-smokers (p> 0.05). Results are similar to those in the study by Mai Tien Dung (2015) in which HCy levels in smokers were significantly higher (p <0.05) than those who did not smoke Hs-CRP concentration and rate was insignificantly (p> 0.05) higher in the smokers group (p> 0.05) [2]. The study by Katarzyna Korzeniowska and et al (2015) showed that the smoker's HCy concentration was significantly higher than the non-smoking group (p <0.05). Smoking makes quickly increasing atherosclerosis changes in endothelial structure chronic inflammation of the coronary arteries leading to increases in Hs-CRP and HCy.

The study also showed a correlation between HCy level and alcohol consumption (OR = 1.23). In accordance with the research by Pham Duc Thoi (2009) there was a correlation between the increase of HCy and alcohol consumption (OR = 2.86) [4]. Nguyen Van Tuan (2016) suggested that there was no correlation between HCy increase and alcohol abuse. [3] Excessive alcohol consumption (> 2 units of alcohol per day) can be harmful to health. Alcohol can increase blood pressure platelet aggregation blood clotting triglycerides cause atrial fibrillation cardiomyopathy increase liver enzymes and cause many other disorders. These are some cardiac disorders.

Our study found that mean HCy and Hs-CRP levels in the study group were significantly higher in dyslipidemia but insignificantly (p> 0.05) in the study group.). Similar to the results from the study by Mai Tien Dung (2015) HCy and Hs-CRP levels mean in patients with dyslipidemia were not statistically significant in the non-dyslipidemic group [2]. Nguyen Van Tuan (2016) found no association between HCy increase and Cholesterol. HDL-C TG had a negative correlation with LDL-C. According to Schillaci G (2003) Hs-CRP depended on cholesterol HDL-C LDL-C and triglyceride indexes [8].

5. CONCLUSION

By studying the correlation between plasma Hs-CRP and plasma HCy levels with a number of risk factors for 92 hypertensive patients we have some conclusions:

- Risk factors of hypertension: family history 42.2% drinking alcohol 38.0%, high salt intake 63.0%, smoking 35.8%, overweight and obesity 45.7% and dyslipidemia 76.1%.
- There was a correlation between HCy concentration Hs-CRP and age; HCy concentration with smoking high salt intake. No correlation was found between HCy and Hs-CRP levels with BMI alcohol consumption dyslipidemia.

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TÓM TẮT

MỐI LIÊN QUAN GIỮA NỒNG ĐỘ HOMOCYSTEIN, HS-CRP HUYẾT TƯƠNG VỚI MỘT SỐ YẾU TỐ NGUY CƠ Ở BỆNH NHÂN TĂNG HUYẾT ÁP NGUYÊN PHÁT

Bùi Văn Nam, Lê Văn Quân

Bệnh viện Quân y 103

Mục tiêu: *(1) Xác định một số yếu tố nguy cơ ở bệnh nhân tăng huyết áp nguyên phát tại Bệnh viện Quân y 103. (2) Các định mối tương quan giữa nồng độ Hcy, Hs-CRP huyết tương với một số yếu tố nguy cơ trên. Phương pháp: được thực hiện trên 92 bệnh nhân. Các chỉ tiêu nghiên cứu gồm: yếu tố nguy cơ, nồng độ HCy, Hs-CRP huyết tương. Kết quả: Các yếu tố nguy cơ gồm béo phì và tăng huyết áp (45.7%), tiền sử gia đình (42.4%), hút thuốc (35.9%), lạm dụng rượu (38%), chế độ ăn nhiều muối (63%), rối loạn lipid máu (76.1%). Có mối tương quan thuận giữa nồng độ HCy, Hs-CRP huyết tương và tuổi, chế độ ăn nhiều muối. Không thấy có mối tương quan giữa nồng độ HCy, Hs-CRP huyết tương và BMI, lạm dụng rượu hay rối loạn lipid máu.. Kết luận: có mối tương quan giữa HCy, Hs-CRP huyết tương và một số yếu tố nguy cơ của bệnh tăng huyết áp nguyên phát.*

Từ khóa: *tăng huyết áp nguyên phát, Homocysteine, Hs-CRP.*