

RAISED SERUM HOMOCYSTEINE LEVEL IS ASSOCIATED WITH HYPERTENSION

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ABSTRACT

An elevated serum homocysteine concentration is associated with an increased risk of coronary, cerebral, and peripheral vascular disease. The objective of the study was to evaluate the association of serum homocysteine level with hypertension (HTN). This cross sectional analytical study was conducted at Sir Salimullah Medical College & Mitford Hospital and National Health Care Network Dhaka, Bangladesh over a duration of 21 months from July 2012 to May 2014. Fifty HTN patients were included as study subjects and age and sex matched fifty non-HTN healthy controls were included. All the clinical measurements were taken and serum Hcy was measured for all study subjects. In this study, females were predominant in both groups, mean age of the HTN patients was 41.0 ± 5.6 years and non-HTN healthy subjects was 38.2 ± 5.2 years. BMI and FBG were found higher in HTN group than that of non-HTN group but the differences were not statistically significant. Systolic and diastolic BP were found significantly higher in HTN group than that of non-HTN group. Serum Hcy level was significantly higher in HTN group ($19.93 \pm 4.12 \mu\text{mol/L}$) than that of non-HTN group ($13.20 \pm 1.88 \mu\text{mol/L}$). This study depicted that serum Hcy had significant correlation with SBP and DBP in HTN. In conclusion, it was seen that elevated serum Hcy level is associated with hypertension.

Key Words: Serum homocysteine, hypertension.

Introduction

Hypertension is recognized as major contributor to the disease burden globally¹. Once the relationship between homocysteine and hypertension was less understood². As many of the risk factors for hypertension and other cardiovascular diseases overlap, it is difficult to deduce when one is a risk factor for the other. However, the mechanisms by which homocysteine is thought to affect the vascular endothelium are consistent with in vitro research and known mechanisms for hypertension³. Hcy may play a role in the

pathogenesis of hypertension is based on the fact that, Hcy induces arteriolar constriction, renal dysfunction and increased sodium reabsorption, increased arterial stiffness⁴. Hcy increases oxidative stress, which causes oxidative injury to the vascular endothelium, diminishing vasodilation by nitric oxide, stimulating proliferation of vascular smooth muscle cells and altering the elastic properties of the vascular wall, leading to hypertension⁴.

The vascular risk associated with hyperhomocysteinaemia has been observed to be

stronger in hypertensive individuals⁵. More recently, attention has been focussed on the direct relations of plasma homocysteine to blood pressure and hypertension because of the suggestion that the adverse risk associated with hyperhomocysteinaemia might be mediated in part by the positive association of homocysteine with hypertension⁶⁻⁸.

Several epidemiologic studies have demonstrated that elevated plasma total homocysteine has a modest effect on the risk of cardiovascular disease⁹. Atif *et al.*¹⁰ observed that 80% of hypertensive subjects were hyperhomocysteinaemic. Data suggest that elevated Hcy is an independent risk factor for primary hypertension as well as primary pulmonary hypertension^{11,12}. Hypertensive patients typically have higher homocysteine than normotensive controls,¹³ a condition exacerbated by smoking¹⁴ and menopause¹⁵. In addition, the Dietary Approaches to Stop Hypertension (DASH) diet, recommended to hypertensive patients, is beneficial for lowering blood pressure as well as homocysteine¹⁶. So far no such study was conducted in our country, that's why we decided to do this study to evaluate the association of serum homocysteine level with hypertension.

Methods

This cross sectional analytical study was conducted at Sir Salimullah Medical College & Mitford Hospital and National Health Care Network Dhaka, Bangladesh over a duration of 21 months from July 2012 to May 2014. Fifty HTN patients were included as study subject and age- and sex- matched fifty non-HTN healthy controls were included. Subjects with coronary heart disease, significant valvular disease, life-threatening systemic disease, chronic obstructive pulmonary diseases were excluded from the study. Female pregnant subjects, oral contraceptive pill taking female, post menopausal women and subjects receiving

steroid, anti depressants and anti convulsants drugs were also excluded from this study. BP was measured by standard protocol given by JNCVII. All the clinical measurements were taken and serum Hcy was measured for all study subjects. Data were collected, compiled and tabulated according to key variables. The analyses of different variables were done according to standard statistical analysis by using SPSS-12. For all analyses, level of significance were set at 0.05 and p-value <0.05 were considered significant.

Results

In this study, mean age of the HTN patients was 41.0 ± 5.6 years and non-HTN healthy subjects was 38.2 ± 5.2 years. Minimum age was 26 years and maximum age was 50 years. Female were predominant in both groups (Table 1). Mean BMI was 28.23 ± 3.76 kg/m² in HTN group and 26.86 ± 3.63 kg/m² in non-HTN group, difference was not statistically significant. Mean SBP was 137.7 ± 11.70 mm Hg in HTN group and 116.00 ± 5.05 mm Hg in non-HTN group and mean DBP in HTN group was 86.80 ± 7.19 mmHg and in non-HTN group was 72.30 ± 6.99 mm Hg, differences were statistically significant ($p < 0.001$). Mean FBG was 5.16 ± 0.99 mmol/L in HTN group and 4.85 ± 0.58 mmol/L in non-HTN group but the difference was not statistically significant ($p > 0.001$) (Table 2). Mean serum Hcy level was significantly higher in HTN group (19.93 ± 4.12 μ mol/L) than that of non-HTN group (13.20 ± 1.88 μ mol/L) (Table 3). This study depicted that serum Hcy had significant correlation with serum SBP and DBP in HTN (Table 4).

Table-I: General characteristics of the subject

	HTN n=50	Non-HTN n=50	Total
21-30 years	02 (04%)	05 (10%)	07%
31-40 years	25 (50%)	33 (66%)	58%
41-50 years	23 (46%)	12 (24%)	35%
Mean (\pm SD)	41.0 \pm 5.6	38.2 \pm 5.2	26-50 years
Male	18 (36%)	22 (44%)	40%
Female	32 (64%)	28 (56%)	60%

Table-II: Clinical and biochemical findings of the study population

	HTN (Mean \pm SD)	Non-HTN (Mean \pm SD)	P value
BMI (kg/m ²)	28.23 \pm 3.76	26.86 \pm 3.63	0.068
SBP (mm of Hg)	137.7 \pm 11.70	116.00 \pm 5.05	<0.001
DBP (mm of Hg)	86.80 \pm 7.19	72.30 \pm 6.99	<0.001
Serum FBG (mmol/L)	5.16 \pm 0.99	4.85 \pm 0.58	0.068

Unpaired 't' test was done to measure the level of significance

Table-III: Mean serum Hcy level of the study population

	HTN (Mean \pm SD)	Non-HTN (Mean \pm SD)	P value
Serum Hcy (μ mol/L)	19.93 \pm 4.12	13.20 \pm 1.88	<0.001

Unpaired 't' test was done to measure the level of significance

Table-IV: Correlation of serum Hcy level with the clinical findings

Variables	HTN		Non-HTN	
	r	P value	r	P value
BMI kg/m ²	0.197	0.171	-0.025	0.863
SBP (mm of Hg)	0.522	0.001	-0.015	0.919
DBP (mm of Hg)	0.334	0.018	-0.048	0.741

Discussion

In this study mean age was 41.0 \pm 5.6 years in HTN group and 38.2 \pm 5.2 years in non-HTN group. Among both groups female were predominant. Korzeniowska *et al.*¹⁷ taken 18 hypertensive and 15 normotensive subjects, their mean age was 43 \pm 16 years and 47 \pm 10 years. In their study male were predominant. It was evident from the study that BMI was higher in HTN group (28.23 \pm 3.76 kg/m²) than in non-HTN group (26.86 \pm 3.63 kg/m²). Similar observation was found in the study of Korzeniowska *et al.*¹⁷. It was observed in our study that both SBP and DBP were significantly higher in HTN subjects in comparison to non-HTN. Similar findings were found in other studies^{17,18}. The present study shows that serum Hcy levels were significantly higher in HTN than that of non-HTN. Similar findings were found in other studies¹⁷⁻¹⁹. The European Concerted Action Project also confirmed that the elevated plasma homocysteine was an independent risk factor for CVD, and calculated that an increase of 5 μ mol/L was associated with the increase in relative risk for CVD of 1.355. A one-standard deviation increase in homocysteine was associated with an increase in systolic blood pressure (SBP) and diastolic blood pressure (DBP) of 0.7 and 0.5 mm Hg in men, respectively, and in women, the increases in SBP and DBP were 1.2 and 0.7 mm Hg, respectively⁶. These observations have been confirmed in other cross-sectional reports and in experimental studies²⁰. Additionally, a potential causal role for homocysteine in the pathogenesis of elevated blood pressure is raised by the demonstration that homocysteine-lowering treatment is associated with a reduction in systolic and diastolic blood pressures²¹. Thus, a considerable body of evidence suggests a role for plasma homocysteine in the pathogenesis of hypertension⁸. It was also found that serum Hcy was positively correlated with systolic and diastolic blood pressure. High Hcy levels had been reported in HTN patients¹⁸. Thus it is evident from the study that Hcy is associated with hypertension.

Conclusion

Elevated serum Hcy level is associated with hypertension.

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